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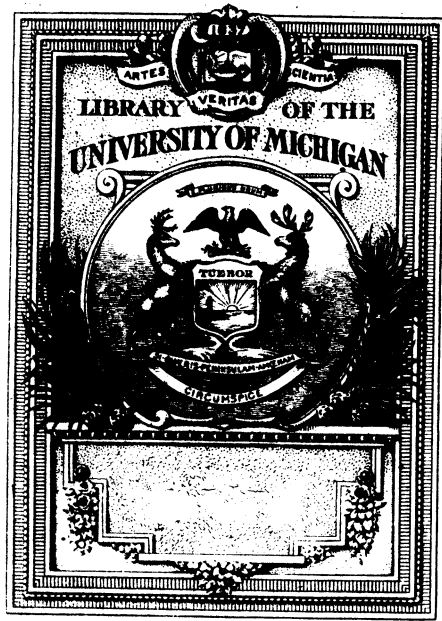
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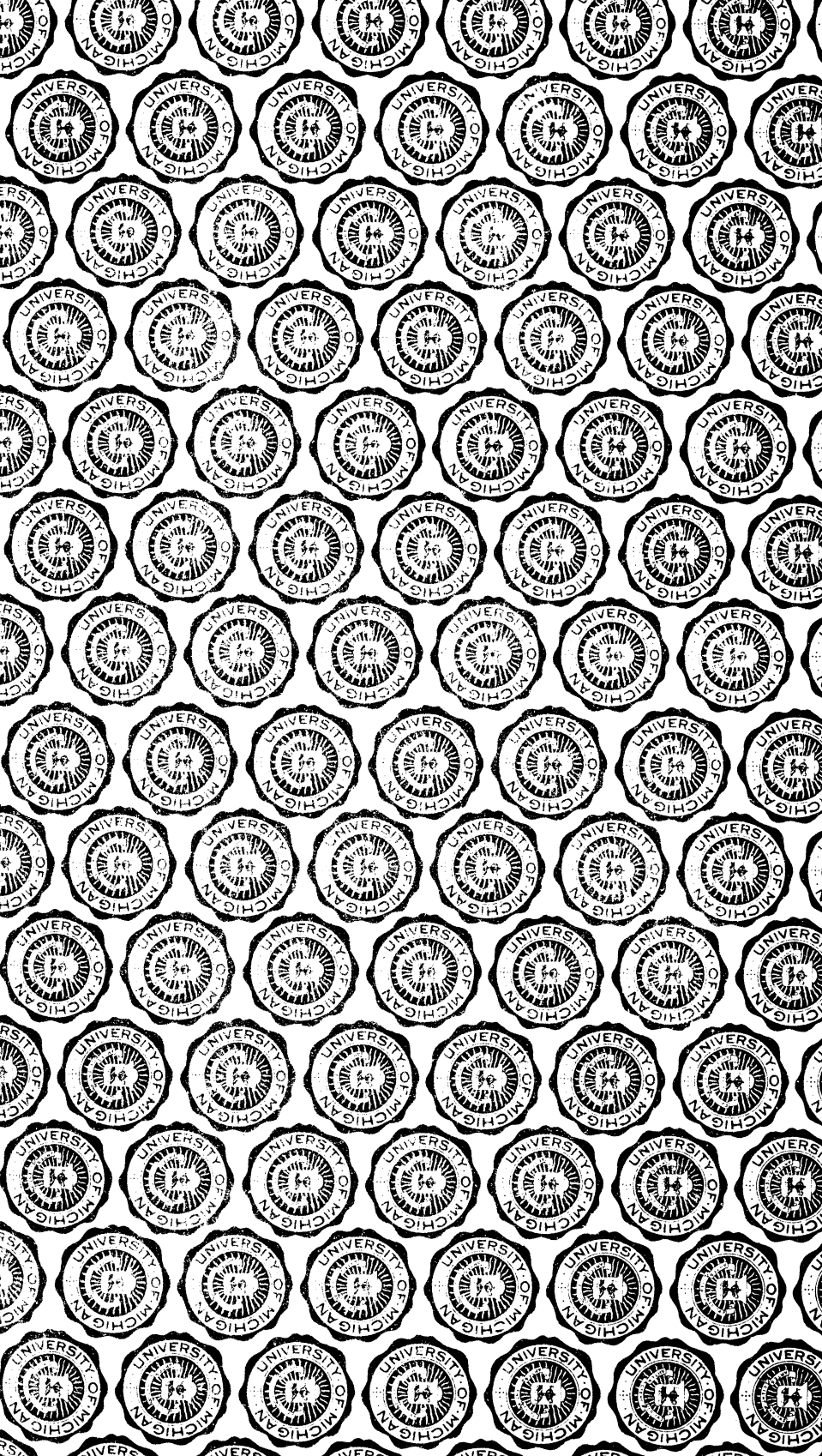
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Philippine islands, Bureau of Science

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# AMPHIBIANS AND TURTLES OF THE PHILIPPINE ISLANDS

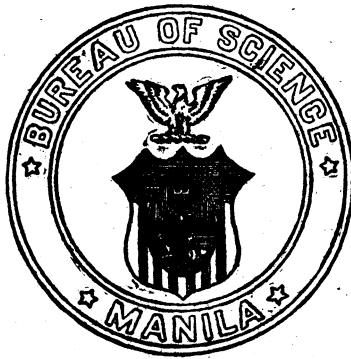
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BY

EDWARD H. TAYLOR



MANILA  
BUREAU OF PRINTING  
1921

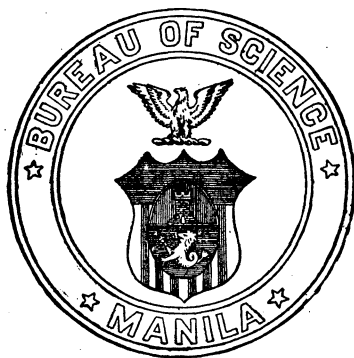
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# AMPHIBIANS AND TURTLES OF THE PHILIPPINE ISLANDS

BY

EDWARD H. TAYLOR



MANILA  
BUREAU OF PRINTING  
1921

**DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES  
BUREAU OF SCIENCE  
MANILA**

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390

## PREFACE

The need for the publication of a work on Philippine Amphibia and turtles has been felt for a long time. Boulenger's work,\* published in 1882, contains descriptions of but a small part of the amphibian fauna known at present. The authentic data of Boettger's† and Casto de Elera's‡ lists are largely drawn from Boulenger's work. Recent literature on the group is widely scattered among various publications. Recent lists of Philippine turtles are very untrustworthy.

The present work is based largely on my private collection of amphibians and turtles made in the Philippines from 1912 to 1916, and upon the collection in the Bureau of Science, made since American occupation. In order that it may serve in a measure as an introduction to the study of these groups I have included a few general facts concerning them.

The treatment of species is similar to that followed by other authors; namely, synonymy, description of species, color, measurements, variations, and remarks. The synonymies are far from complete and refer mainly to Philippine specimens.

Descriptions for the most part have been drawn from material collected and examined by myself. Where specimens have not been available, I have included the original description or a translation of it. In the definition of larger groups Boulenger has been drawn upon largely. Usually, however, quotations have been credited directly to the authors.

The colors given are those of living specimens, unless otherwise noted; and under remarks are given habits, habitats, and distribution of the various species.

Some of the drawings have been copied from the works of other authors.

EDWARD H. TAYLOR.

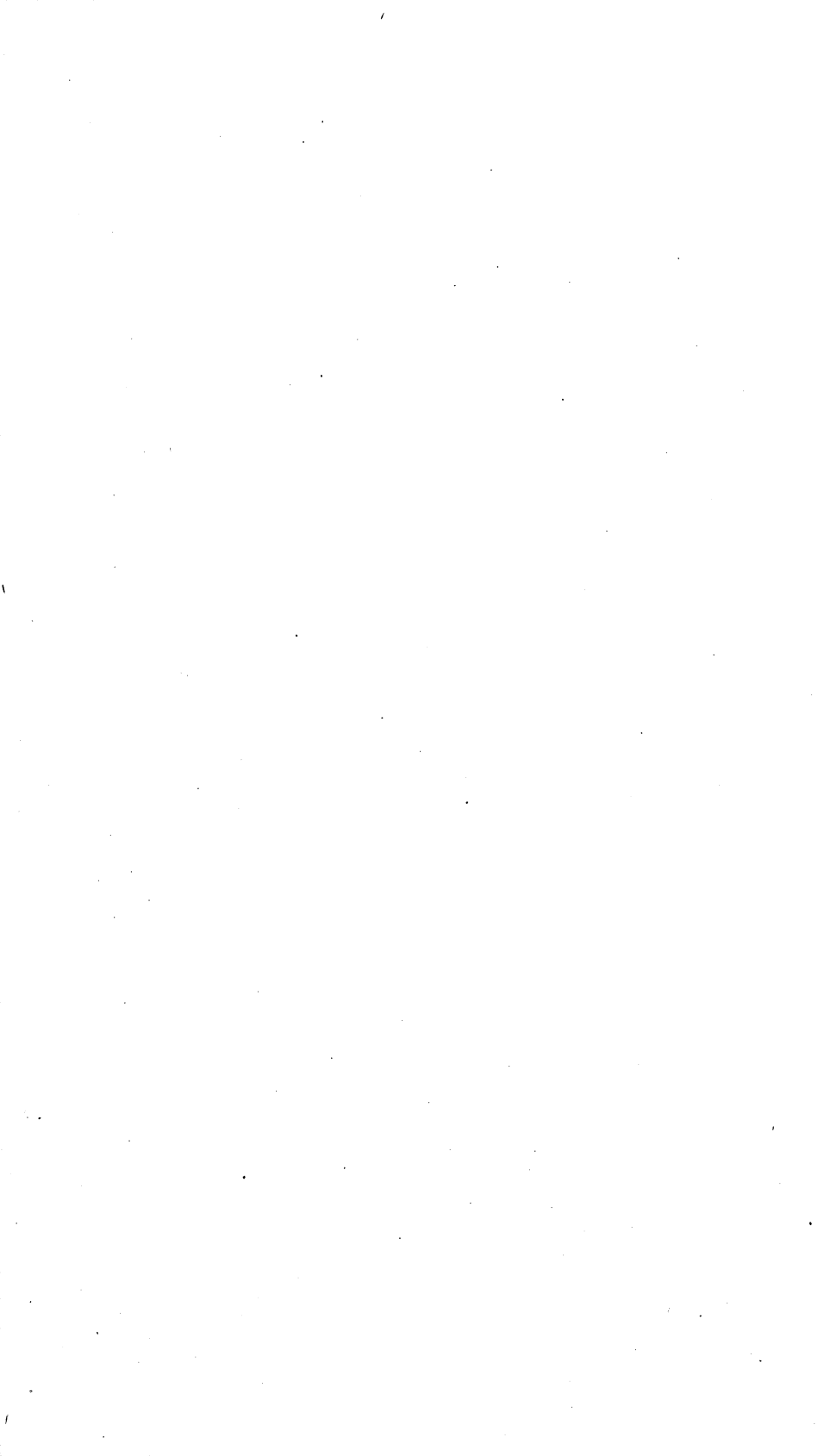
MANILA, P. I., *September 1, 1918.*

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\* Boulenger, Cat. Batr. Sal. Brit. Mus., 2d ed. (1882). London.

† Boettger, Ber. Senck. Nat. Ges. (1882) 91-134.

‡ Casto de Elera, Cat. Fauna Filipinas 1 (1895) 445-453.

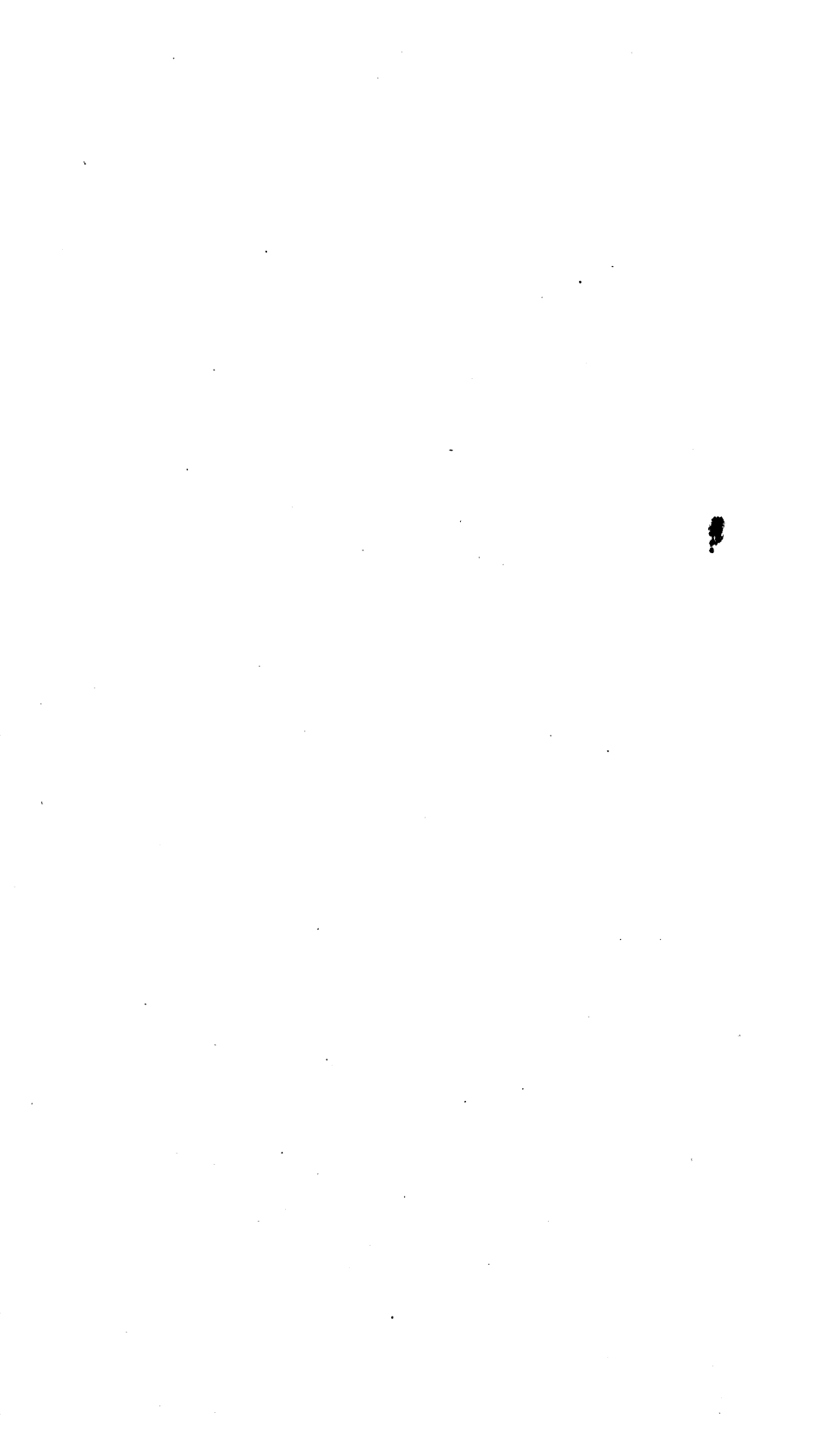


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## ILLUSTRATIONS \*

[Drawings by M. Ligaya; photographs by E. Cortes.]

### PLATE 1

- FIG. 1. *Oxyglossus lævis* Günther. After Günther, Cat. Batr. Sal. Brit. Mus. (1858), pl. 1, fig. A.
2. *Rana erythræa* (Schlegel). Photograph of a preserved Negros specimen, E. H. Taylor collection; reduced.
3. *Philautus leitensis* (Boulenger). Photograph of a preserved specimen, No. B38, Bureau of Science collection; about natural size.
4. *Rana moellendorffi* Boettger. Photograph of a preserved Palawan specimen, Bureau of Science collection; about natural size.
5. *Rana moodiei* Taylor. Photograph of the preserved type specimen; reduced.

### PLATE 2

- FIG. 1. *Rana leytsensis* Boettger. Photograph of a preserved specimen; somewhat reduced.
2. *Rana magna* Stejneger. Photograph of a preserved Polillo specimen; greatly reduced.
3. *Rana vittigera* Wiegmann. Photograph of a freshly killed specimen; greatly reduced.
4. *Polypedates leucomystax* (Gravenhorst). Photograph of a newly killed specimen; natural size.

### PLATE 3

- FIG. 1. *Cornufer laticeps* Taylor. Drawing of the type; slightly reduced.
2. *Philautus hazelæ* Taylor. Drawing of the type; natural size.
3. *Chaperina beyeri* Taylor. Drawing of the type; natural size.
4. *Rana parva* Taylor. Drawing of the type; natural size.
5. *Philautus montanus* Taylor. Drawing of the type; natural size.

### PLATE 4

- FIG. 1. *Polypedates pardalis* (Günther). Photograph of the type of *Rhacophorus rizali* Boettger.
2. *Staurois natator* (Günther). 2a, mouth. After Günther, Cat. Batr. Sal. Brit. Mus. (1858), pl. 4, fig. C.
3. *Cornufer corrugatus* (Duméril). 3a, mouth; 3b, foot. After Günther, Cat. Batr. Sal. Brit. Mus. (1858), pl. 8, fig. 3 (*Platymantis plicifera*).

\* Photographs of preserved specimens of frogs and toads are not satisfactory for showing the characters of the digits, because these parts dry and shrink rapidly when exposed to the air, as is necessary in photographing them.

4. *Rana mearnsi* Stejneger. Photograph of a preserved Negros specimen; much reduced.
5. *Rana similis* (Günther). Photograph of a preserved Luzon specimen; somewhat reduced.

## PLATE 5

- FIG. 1. *Rana glandulosa* Boulenger. 1a, mouth; 1b, underside of head, showing arm glands. After Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882), pl. 7.
2. *Rana sanguinea* Boettger. Photograph of a preserved Busuanga specimen; somewhat reduced.

## PLATE 6

- FIG. 1. *Rana everetti* Boulenger. 1a, side of head; 1b, mouth. After Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882), plate.
2. *Polypedates pardalis* (Günther). 2a, mouth. After Günther, Cat. Batr. Sal. Brit. Mus. (1858), pl. 6, fig. D.

## PLATE 7

- FIG. 1. *Hazelia spinosa* Taylor. Drawing of the type; natural size.
2. *Rana grandocula* Taylor. 2a, side of head. Drawing of the type; natural size.
3. *Nectophryne lighti* Taylor. 3a, side of head. Drawing of the type;  $\times 4$ .

## PLATE 8

- FIG. 1. *Cornufer guentheri* Boulenger. 1a, mouth. After Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882), pl. 11, fig. 3.
2. *Polypedates appendiculatus* (Günther). 2a, foot; 2b, mouth. After Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882), pl. 8, fig. 4.
3. *Cornufer meyeri* (Günther). After Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882), pl. 11, fig. 4.
4. *Megalophrys hasselti* (Tschudi). 4a, side of head. After Boulenger, Proc. Zool. Soc. London (1898) plate.

## PLATE 9

- FIG. 1. *Kaloula conjuncta* (Peters). Photograph of a preserved Mindanao specimen; somewhat reduced.
2. *Kalophrynus stellatus* Stejneger. Photograph of a preserved specimen; natural size.
3. *Chaperina visaya* Taylor. Photograph of the type, enlarged.
4. *Kaloula picta* (Bibron). Photograph of a preserved specimen; natural size.
5. *Bufo philippinicus* Boulenger. Photograph of a preserved specimen; somewhat reduced.

## PLATE 10

- FIG. 1. *Megalophrys stejneri* Taylor. Drawing of the type; natural size. 1a, side of head.
2. *Megalophrys ligayæ* Taylor. Drawing of the type; natural size. 2a, side of head.

## PLATE 11

- FIG. 1. *Cyclemys amboinensis* (Daudin); a medium-sized specimen, showing serrations on posterior part of carapace.  
 2. *Cyclemys amboinensis* (Daudin); an old specimen, without serrations and with differently shaped carapace.  
 3. *Heosemys leytenensis* Taylor; from the type, dorsal view.  
 4. *Heosemys leytenensis* Taylor; from the type, ventral view.

## PLATE 12

- FIG. 1. *Cyclemys dhor* Gray; young, dorsal view, somewhat reduced.  
 2. *Cyclemys dhor* Gray; young, ventral view.  
 3. *Cyclemys amboinensis* (Daudin); young, dorsal view, somewhat reduced.  
 4. *Cyclemys amboinensis* (Daudin); ventral view.

## PLATE 13

- FIG. 1. *Heosemys leytenensis* Taylor; head of the cotype, from Leyte, enlarged.  
 2. *Cyclemys amboinensis* (Daudin); ventral view of an old specimen, showing no serrations on the posterior border of the carapace.  
 3. *Cyclemys amboinensis* (Daudin); ventral view of a variety with the posterior border of the carapace serrated; reduced.

## PLATE 14

- FIG. 1. *Cyclemys dhor* Gray; dorsal view of a carapace in the Bureau of Science collection, with rather distinct posterior serrations.  
 2. *Cyclemys dhor* Gray; ventral view.  
 3. *Cyclemys dhor* Gray; a living specimen owned by Mr. W. Schultze, of Manila; dorsal view, reduced.  
 4. *Cyclemys dhor* Gray; ventral view, reduced.

## PLATE 15

- FIG. 1. *Eretmochelys imbricata* (Pennant); a young specimen from Aparri, Luzon; dorsal view.  
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## PLATE 16

- FIG. 1. *Caretta olivacea* (Eschscholtz); a young specimen in the Bureau of Science aquarium; dorsal anterior view, reduced.  
 2. *Caretta olivacea* (Eschscholtz); ventral posterior view.  
 3. *Pelochelys cantorii* Gray; a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.  
 4. *Pelochelys cantorii* Gray; ventral posterior view.  
 5. *Eretmochelys imbricata* (Pennant); a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.  
 6. *Eretmochelys imbricata* (Pennant); ventral posterior view.

## PLATE 17

- FIG. 1. *Chelonia japonica* (Thunberg); a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.  
 2. *Chelonia japonica* (Thunberg); ventral anterior view.  
 3. *Chelonia japonica* (Thunberg); young dorsal view.  
 4. *Chelonia japonica* (Thunberg); ventral view.

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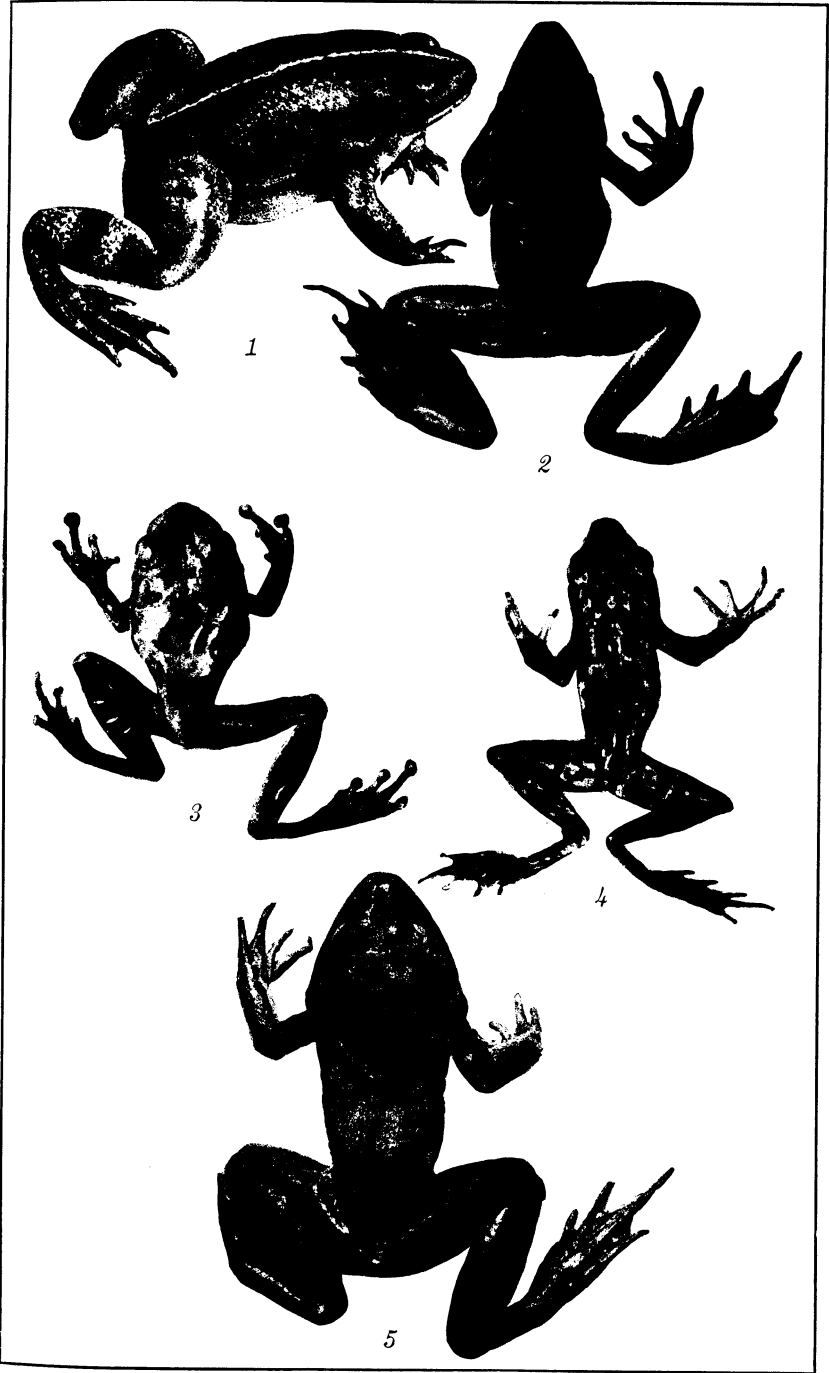


PLATE 1. PHILIPPINE AMPHIBIA.





PLATE 2. PHILIPPINE AMPHIBIA.





PLATE 3. PHILIPPINE AMPHIBIA.





PLATE 4. PHILIPPINE AMPHIBIA.



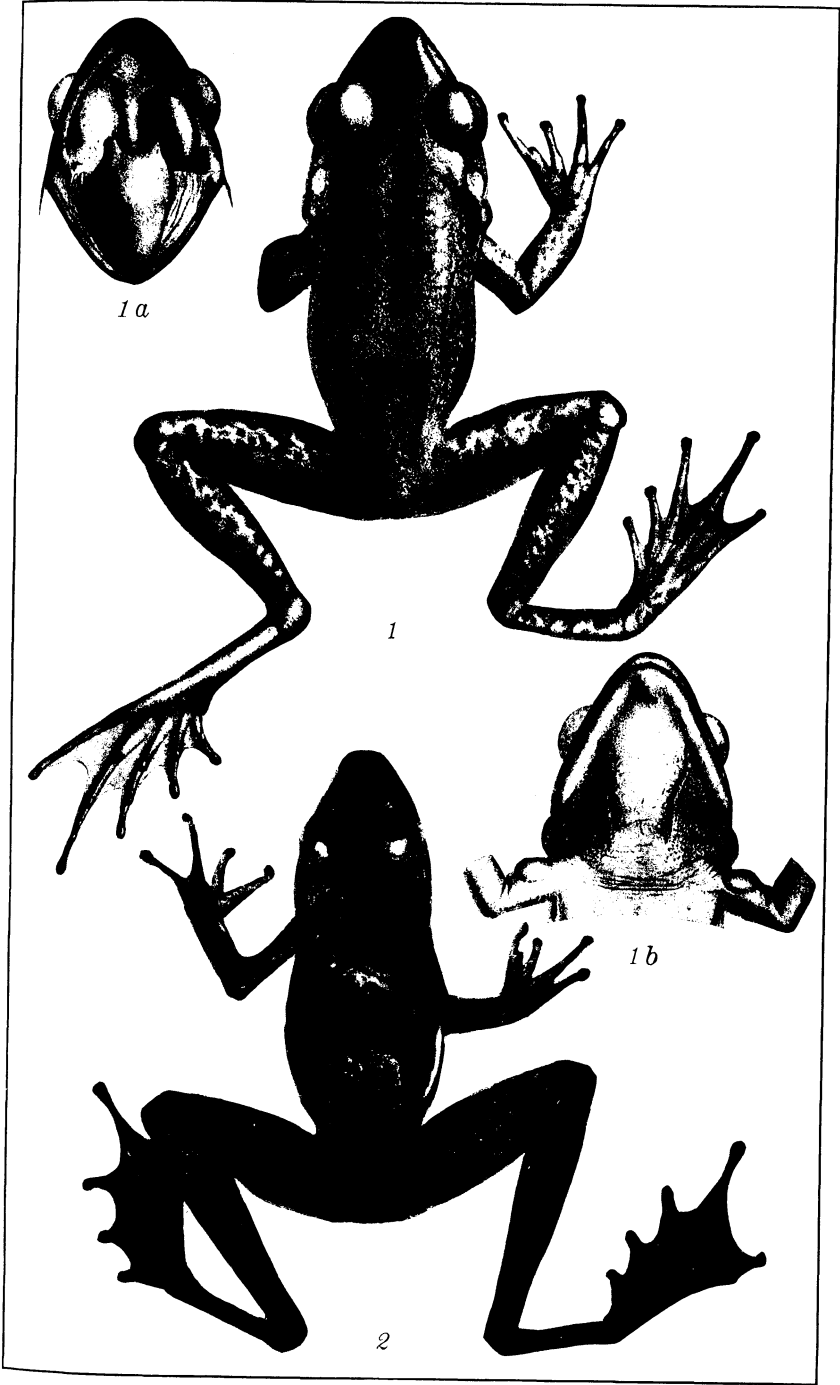


PLATE 5. PHILIPPINE AMPHIBIA.





PLATE 6. PHILIPPINE AMPHIBIA.



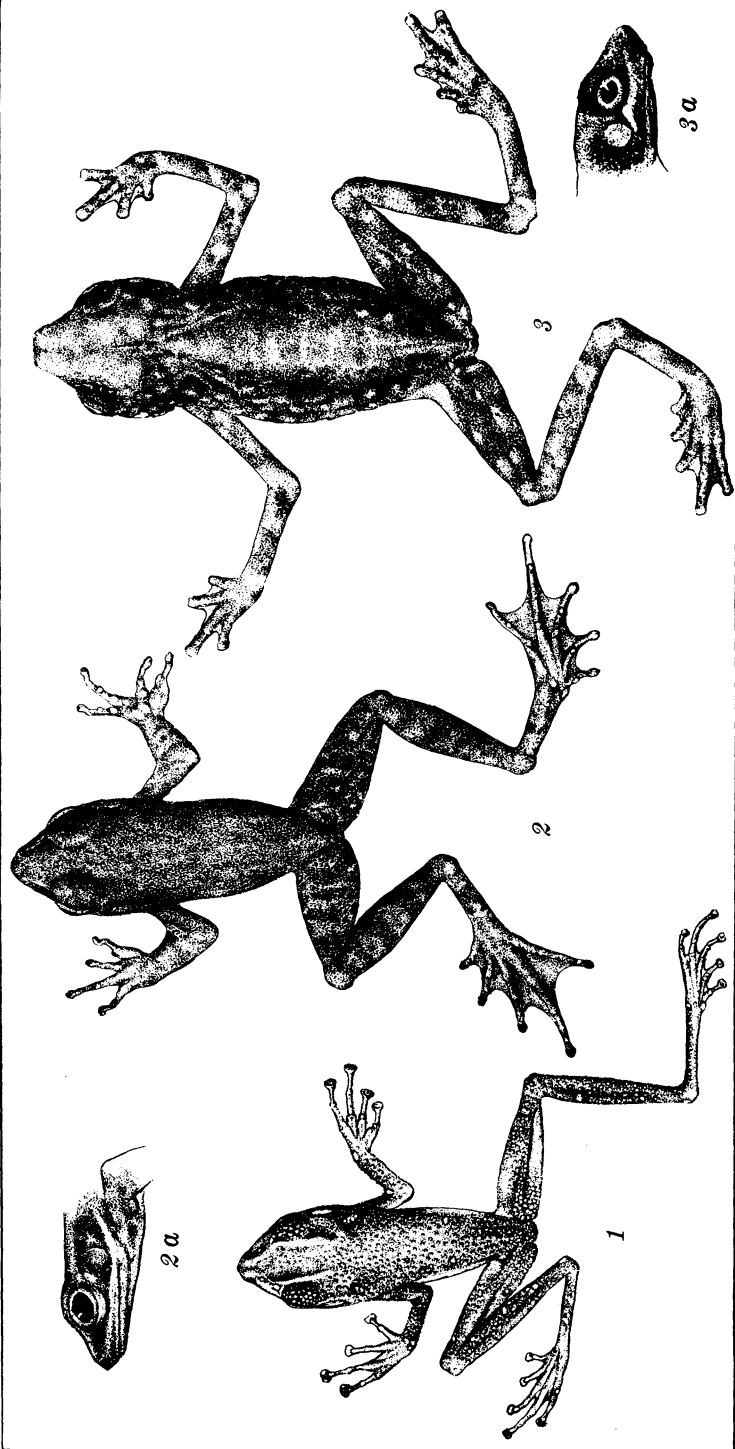


PLATE 7. PHILIPPINE AMPHIBIA.



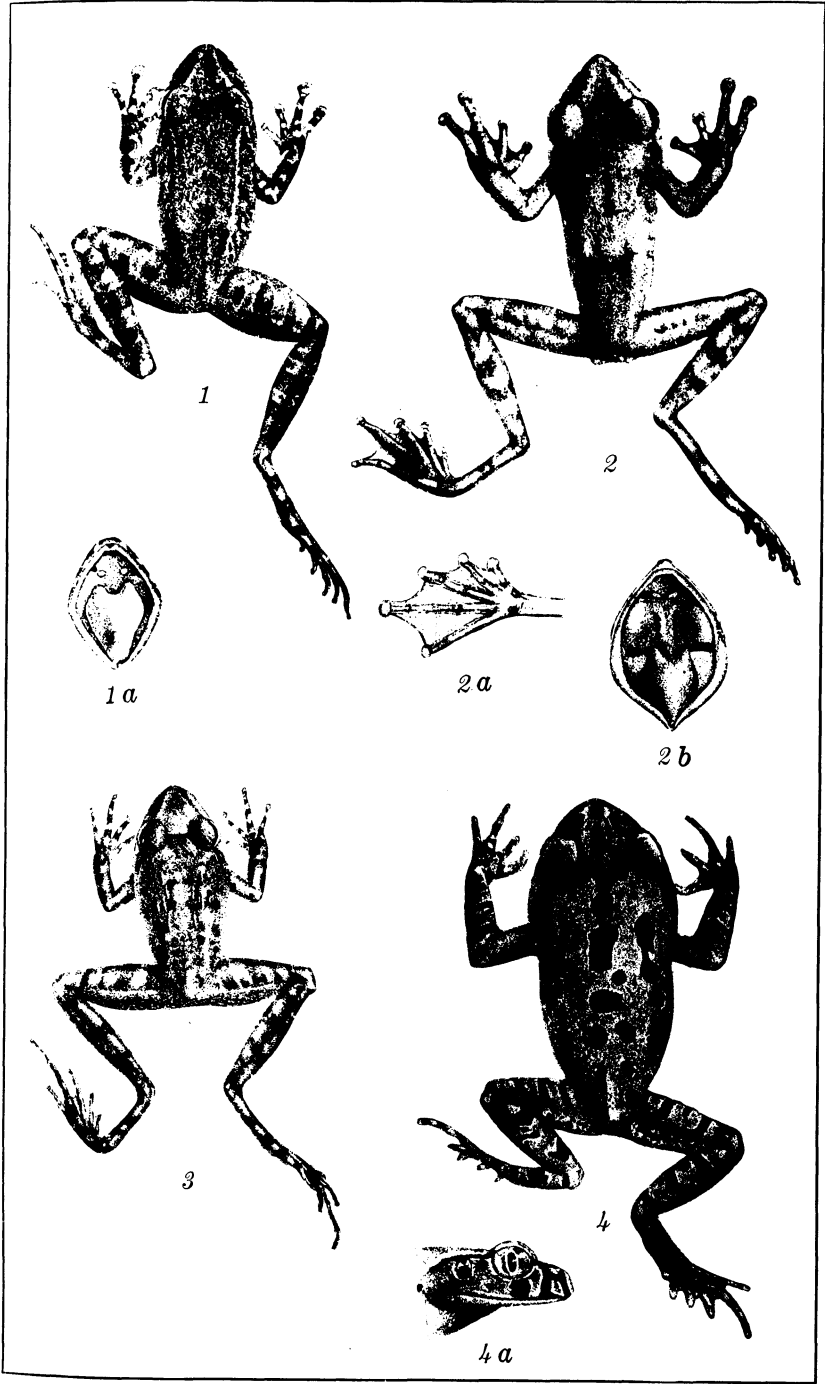


PLATE 8. PHILIPPINE AMPHIBIA.





PLATE 9. PHILIPPINE AMPHIBIA.





PLATE 10. PHILIPPINE AMPHIBIA.



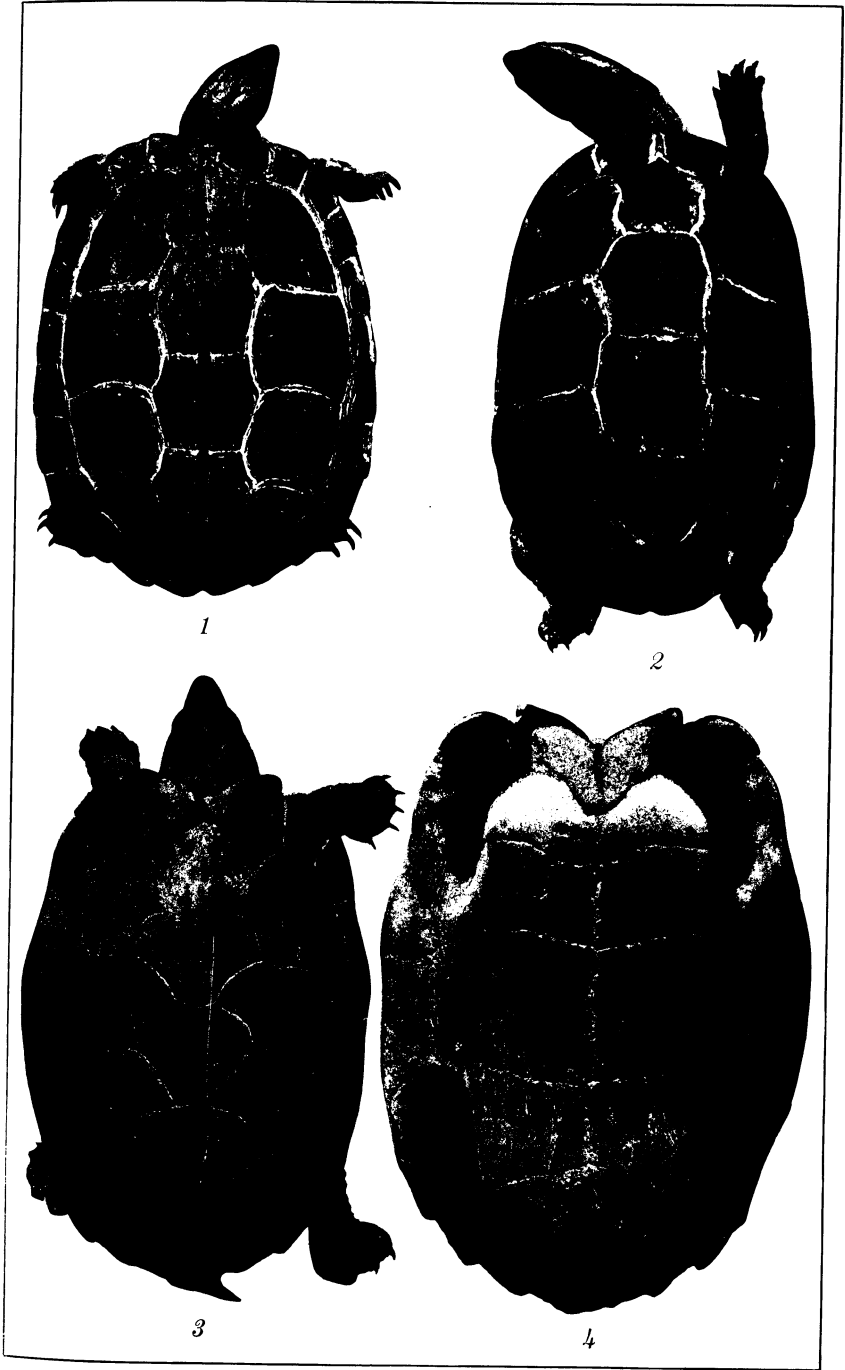


PLATE 11. PHILIPPINE TURTLES.



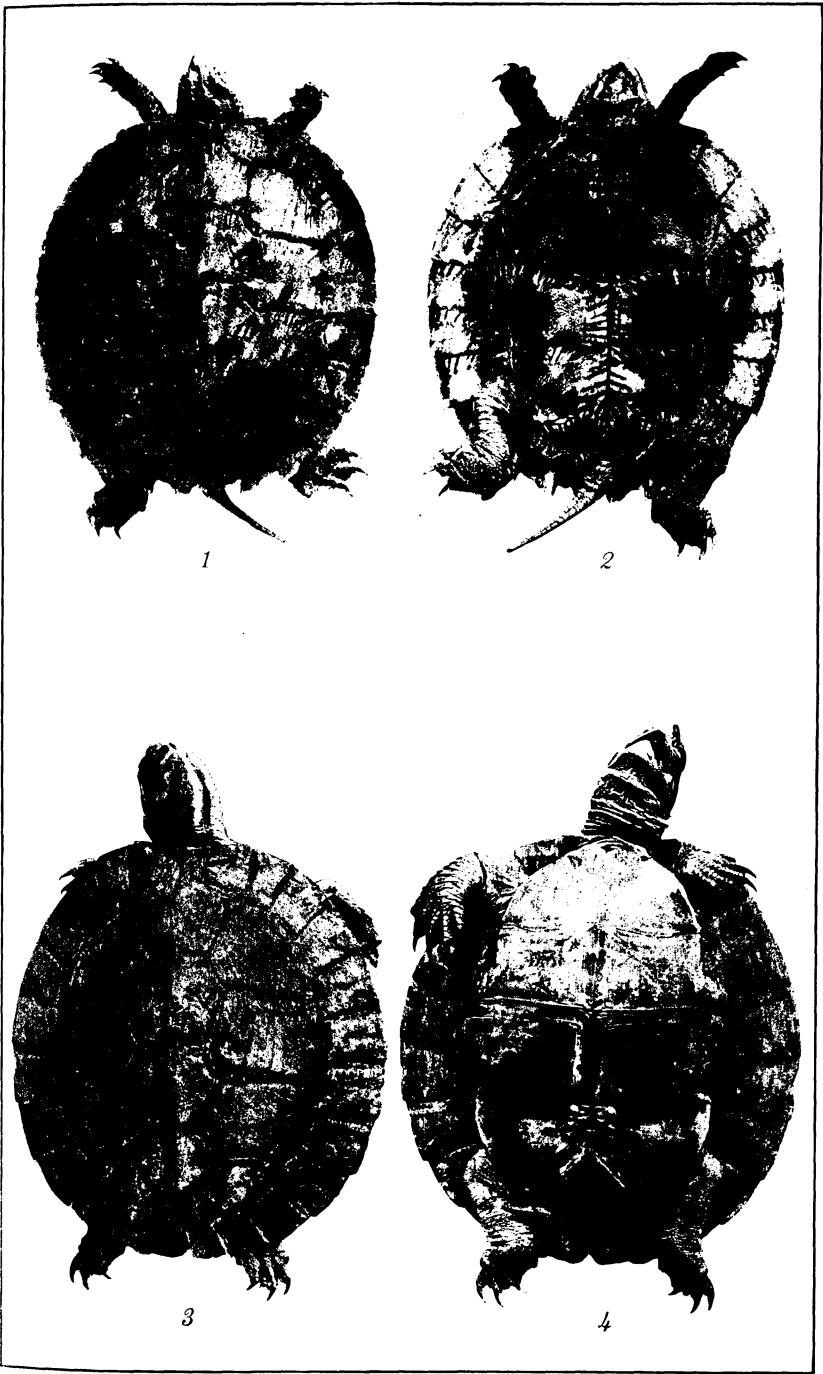
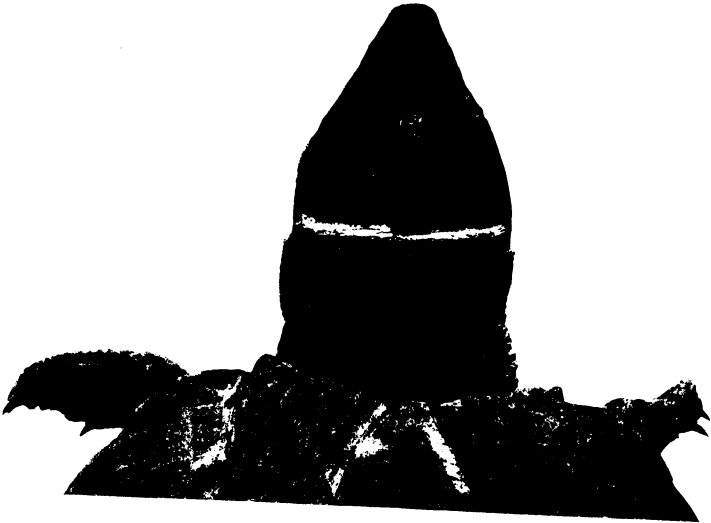


PLATE 12. TWO SPECIES OF CYCLEMYS.

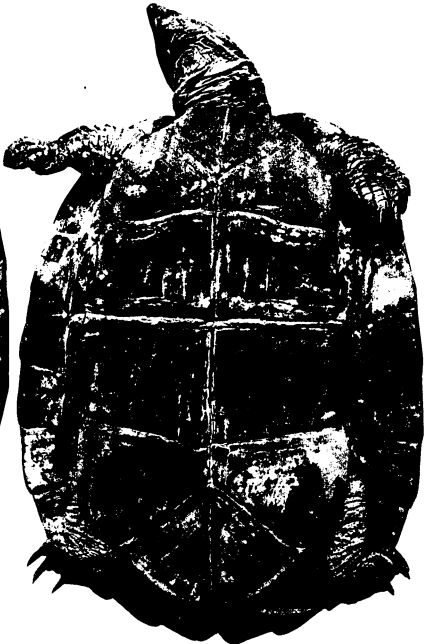




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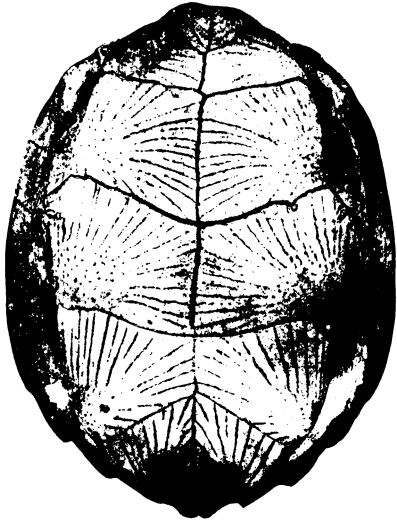
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PLATE 13. PHILIPPINE TURTLES.





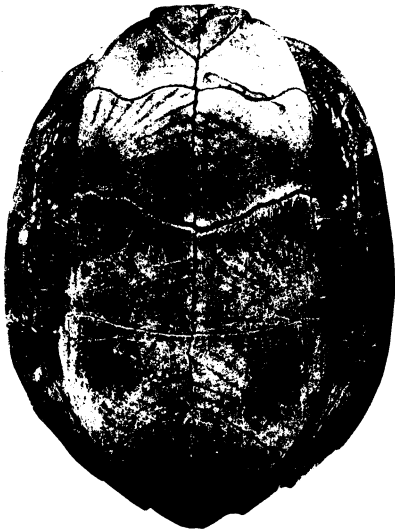
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PLATE 14. CYCLEMYS DHOR GRAY.





PLATE 15. ERETMOCHELYS IMBRICATA (PENNANT).





PLATE 16. PHILIPPINE TURTLES.



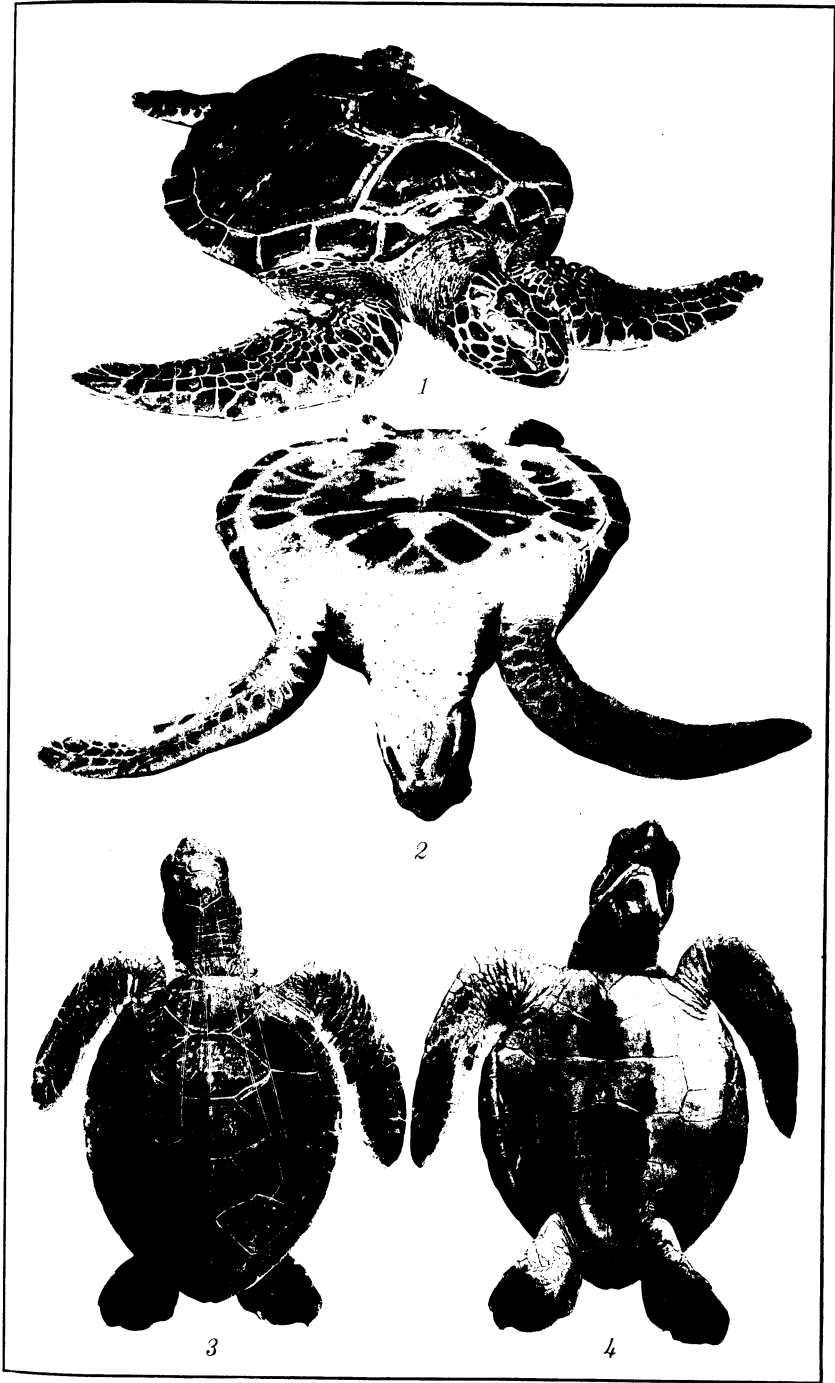


PLATE 17. CHELONIA JAPONICA (THUNBERG).



# AMPHIBIANS AND TURTLES OF THE PHILIPPINE ISLANDS

By EDWARD H. TAYLOR

## PHILIPPINE AMPHIBIANS

### INTRODUCTION

The Philippines are rich in species of Amphibia, no less than sixty-six being treated in this work, which are, probably, not more than one-half of the species that exist in the Islands. Borneo has about 80 known species; New Guinea, 70; Sumatra, 42; Java, 47; Japan and Formosa together, about 50.

No extensive collection of Amphibia has been made in the Philippine Islands, and many of the larger islands have not a single record for specimens. Palawan and Mindanao appear to be better known than Luzon or the Visayan or Sulu groups. Very meager collections have been made in Samar, Leyte, and Mindoro, and apparently none have been made in Bohol, Cebu, or Panay.

### LOCAL NAMES.

Frogs and toads, with the exception of a rare cæcilian in Palawan, constitute the known Amphibia of the Philippines; they are known in the Islands under the Spanish names *rana* and *sapo*, and in the Philippine dialects, under a wide range of generic names. The best known are *palacá* (Tagalog), *talapang* and *cabacab* (Bicol), *panca* (Negros Visayan), and *baqui* (Leyte Visayan). Very few persons differentiate the various species; thus, in the Tagalog dialect three names are applied to the various species; these are *palacang-saguing* for *Polypedates leucomystax*, *palacang-bato* for *Kaloula picta*, and *palacá* applied indiscriminately to various other species. The Visayans of Negros recognize only two species; these are *Rana moodiei*, known under the name of *panca bubungan*, and *Rana erythræa*, known as *panca-manwit*. Among the Manobos of eastern Mindanao I found a greater number of specific names than elsewhere, no less than eight being in use. On the other hand, there appears to be no class or generic name for the group. The species designated are:

| Species.  | Manobo name.    |
|---|-----------------|
| <i>Oxyglossus lewis</i>                                   | <del>Ompa</del> |
| <i>Rana leytenensis</i> and <i>Rana magna</i>             | Ambac.          |
| <i>Rana grandocula</i>                                    | Cóle catóc.     |
| <i>Polypedates leucomystax</i>                            | Ali cá cá.      |
| <i>Polypedates appendiculatus</i>                         | Piong.          |
| <i>Cornufer laticeps</i>                                  | Bag-boag.       |
| <i>Staurois natator</i>                                   | Antig.          |
| <i>Kaloula conjuncta</i> and <i>Kalophrynus stellatus</i> | Coquat.         |

I have made little use of local names in the discussions of species, owing to the fact that these names would be of little or no use in determining the species.

#### ECONOMIC VALUE

The economic value of this group is fairly large. Certain species are sold in the markets of the Islands, and large quantities that are caught and consumed by rural peoples are never taken to market. The catch represents a food value of probably more than half a million pesos annually. It seems highly probable that this sum might easily be doubled if frogs were cultivated for market and their skins utilized for leather. In Japan, France, and the United States quantities of skins of these animals are tanned and made into fine soft leather for use in the arts. It has been reported that:

The skins of frogs and toads are used to a limited extent for leather purposes. Two or three factories in France pay much attention to tanning them, obtaining the raw skins from Northern Africa, Brazil and other tropical regions.

The leather is thin and pliable. It possesses a delicate but not especially attractive grain and is used principally for card cases and other small fancy articles.\*

In many places in the United States, France, and Japan there are large frog farms where frogs are raised for market. The farms are extremely profitable, the product bringing fancy prices in city markets. Usually only the hind legs are sold, and these sometimes sell for as high as 10 pesos † per dozen. The species ordinarily cultivated in the United States is the bullfrog *Rana catesbeiana*, which is the largest American species. There are two or three Philippine species which attain large size, one of which, *Rana magna*, approaches the size of the American bullfrog. There is no doubt that they could be cultivated readily in the swamps and marshes of the Philippines, or even in rice paddies, provided their enemies, snakes and large lizards, were partially eliminated.

\* Rep. U. S. Com. Fish and Fisheries (1902) 351.

† One peso Philippine currency equals 50 cents United States currency.

Many toads of the families Bufonidæ and Brevicipitidæ have poisonous secretions in the skin, which protect them from being eaten by some animals. Snakes, however, will eat most of the species. Only species of the family Ranidæ should be regarded as of value as food for man.

Frogs and toads, particularly in the tadpole stage, destroy many mosquitoes, especially during the rainy season, which is the breeding season for the group. The adults eat quantities of ants, flies, beetles, and other insects.

#### REPRODUCTION

Frogs, toads, and salamanders reproduce by eggs. The eggs are fertilized extraneously, the male clasping the female and remaining on her back during the process of ovulation. As the eggs are being extruded the seminal fluid of the male, which contains the sperms, escapes and flows over and about the eggs, which are fertilized when the sperms enter them. None of the Amphibia, save the cæcilians, has an intromittent sexual organ.

After a given period the young escapes from the egg and passes through a larval stage. During this stage the animal lives for the most part in the water and appears more like a fish than an amphibian. In the salamanders and cæcilians true external gills are developed. In some rare cases the larval stage continues during the entire life of the animal, and it breeds and reproduces even though it has not developed beyond that stage.

In the genus *Ichthyophis*, a representative of the cæcilians, the females place their eggs in underground holes near water. These eggs are about 6 by 9 millimeters in diameter, being more or less oval in outline. In *I. glutinosus* the female coils about the eggs, evidently for the purpose of protecting them from their enemies. The eggs attain a much larger size before hatching; the mature embryo weighs four times as much as the newly laid eggs.\* When the larvæ are hatched, the gills are lost and the young take to the water; but occasionally they come to the surface to breathe. This species attains almost adult size while still in the larval stage, but apparently it does not breed until the adult form is reached. Finally the gill slits close and the fin on the tail disappears, the animal becoming a burrowing land creature; it is said to drown very quickly when placed in water.

There is no authentic record of the occurrence in the Philippines of the true salamanders. I obtained eggs attached to rocks

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\* Sarasin, P. and F., Zur Entwicklungsgeschichte der ceylonischen Blindwühle *Ichthyophis glutinosa*, Erg. Nat. Forsch. auf Ceylon (1887-1890).

in running water in a small stream on Mount Maquiling, Luzon, which had the appearance of salamander eggs; but, having no preserving fluid at hand, I was unable to make the study requisite to determine them before they had disintegrated.

Philippine frogs have various methods of laying their eggs. For the most part the eggs are laid directly in the water. Here the eggs hatch, and the young pass through a larval stage of varying duration, in which stage the large finlike tail develops, but there are no legs. At this time they are known as tadpoles. Later they emerge from the water with four developed legs, a miniature replica of the adult, the tail having disappeared. Certain species, notably *Polypedates leucomystax* (the banana frog, *palacang-saguing*), lay their eggs in a mass of froth or foam deposited along the edges of small pools of water, on reeds or plants growing in the water, or on an overhanging bough of a tree at some distance above water. After about three days the eggs hatch, and the young emerge from the mass, fall into the water, and become free-swimming larvæ. The fully transformed young animal is smaller than the larva, when the latter has attained its greatest size. *Polypedates pardalis* frequently lays its eggs in water collected in holes in trees. *Polypedates appendiculatus* may deposit its eggs in water collected in the axils of the leaves of wild abacá or caladium.

On the small island of Little Govenen, near Basilan, I observed a species of *Cornufer*. This island, which contains only a few hundred square meters of land, has neither standing nor running water, even after a heavy rain; yet this species appears to be able to maintain itself. It is not improbable that the young emerge from the eggs fully transformed, as is known to occur in certain extra-Philippine species.\*

#### FOOD

Frogs and toads are carnivorous, and their food for the most part consists of small insects. However, many species do not depend much on insects. I have examined the stomach contents of numerous species and have found the following: A large specimen of *Rana vittigera* that had just swallowed a full-grown *Kaloula picta*; the stomachs of other species contained tadpoles, earthworms, small pebbles, caterpillars, etc. In the Santo Tomás

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\* On a later visit to the island to determine this fact, no specimen of the species could be found.

Museum, Manila, a large specimen of *Rana vittigera* is preserved which had swallowed a 6-centimeter fresh-water gastropod, the sharp apex of which pierced the stomach and body wall and now extends about 2.5 centimeters beyond the body wall in the region of the shoulder. Certain of the Brevicipitidæ feed almost wholly on ants of various species.

## GEOGRAPHIC DISTRIBUTION

While our knowledge of the distribution of species is far from complete, it may be well to review the known distribution of the families, genera, and species of the Philippine Archipelago, with a view to determining the derivation of the faunas, their relationships, and what light they may throw on the geographic inter-relationships of the various islands within the Archipelago and on the relation of the Philippine group to other island groups in the East Indies and about Australia. Table 1 shows the distribution of the orders of Amphibia in the Orient.

TABLE 1.—*Distribution of the orders of Amphibia in the Orient.*

| Order.         | Australia. | New Guinea. | Celebes. | Mindanao. | Luzon. | Palawan. | Borneo. | Java. | Sumatra. | Malay Peninsula. | Asia. | Japan. |
|----------------|------------|-------------|----------|-----------|--------|----------|---------|-------|----------|------------------|-------|--------|
| Apoda.....     |            |             |          |           |        | ×        | ×       | ×     | ×        | ×                | ×     |        |
| Caudata.....   |            |             |          |           | (?)    |          |         |       |          |                  | ×     | ×      |
| Salientia..... | ×          | ×           | ×        | ×         | ×      | ×        | ×       | ×     | ×        | ×                | ×     | ×      |

The order Apoda is composed of a single family, the Cæciliidæ, represented in the East Indian region by three genera, numbering four or five species. Of the eleven genera of this family recorded in Boulenger's Catalogue,\* the distribution is as follows: Two genera are Malayan, one of which occurs in India and Ceylon, and the other in southern Asia and Africa; five genera are American; two are African; one is American, African, and Asian; one is confined to southern Asia.

There is no authentic record of the occurrence of a species of the order Caudata in the Philippine Islands or in the East Indian and Australian Archipelagoes. It is highly probable that a species may be discovered in Luzon.

\* Boulenger, Cat. Batr. Grad. s. Caud. Batr. Apod. Brit. Mus. ed. 2 (1882).

The order Salientia is well represented in the Malay and East Indian regions, and among its families and genera we may expect to find evidences of faunal relationships and derivations.

From Table 2 it will be observed that, of the seven families represented in the Oriental Region, only four are Philippine; two of these may be wanting in Luzon, since there is no authentic record of any member of either the Bufonidæ or the Pelobatidæ having been found there. Borneo on the one side, and Celebes on the other, each has representatives of the same four families but of no others.

TABLE 2.—*Distribution of the families of Salientia that occur in the Orient.*

| Family.            | Oceania. | New Zealand. | Australia. | New Guinea.    | Celebes. | Mindanao. | Luzon. | Palawan. | Borneo. | Java. | Sumatra. | Malay Peninsula. | Southern Asia. | Central Asia. | Japan. | Europe. | Madagascar. | Southern Africa. | Northern Africa. | North America. | South America. |
|--------------------|----------|--------------|------------|----------------|----------|-----------|--------|----------|---------|-------|----------|------------------|----------------|---------------|--------|---------|-------------|------------------|------------------|----------------|----------------|
| Ranidæ.....        | ×        | —            | * ×        | ×              | ×        | ×         | ×      | ×        | ×       | ×     | ×        | ×                | ×              | ×             | ×      | ×       | ×           | ×                | ×                | ×              | ×              |
| Brevicipitidæ..... | —        | —            | ×          | ×              | ×        | ×         | ×      | —        | ×       | ×     | ×        | ×                | ×              | ×             | ×      | —       | ×           | ×                | ×                | ×              | ×              |
| Cystignathidæ..... | —        | —            | ×          | —              | —        | —         | —      | —        | —       | —     | —        | —                | —              | —             | —      | —       | —           | —                | —                | ×              | ×              |
| Bufonidæ.....      | —        | —            | ×          | —              | ×        | ×         | —      | ×        | ×       | ×     | ×        | ×                | ×              | ×             | ×      | ×       | —           | ×                | ×                | ×              | ×              |
| Hylidæ.....        | —        | —            | ×          | ×              | —        | —         | —      | —        | —       | —     | —        | —                | ×              | ×             | ×      | ×       | —           | —                | ×                | ×              | ×              |
| Pelobatidæ.....    | —        | —            | —          | <sup>c</sup> × | ×        | ×         | —      | ×        | ×       | ×     | ×        | ×                | ×              | ×             | ×      | ×       | —           | —                | ×                | ×              | ×              |
| Discoglossidæ..... | —        | ×            | —          | —              | —        | —         | —      | —        | —       | —     | —        | —                | —              | ×             | ×      | ×       | —           | —                | ×                | ×              | —              |

\* In only the extreme northern part.

<sup>b</sup> In Mexico and Florida.

<sup>c</sup> Depending on the final disposition of *Ranaster convexiusculus* MacLeay.

New Guinea, on the other hand, has no known representative of the Bufonidæ, but has representatives of the Hylidæ,\* and very probably also of the Cystignathidæ, which occurs in Australia.

Japan and Formosa have representatives of four families, but the Hylidæ, not the Pelobatidæ, forms the fourth.

Table 3 shows how poorly frogs and toads are represented in the Philippine Islands by endemic genera. Only a single, recently described genus, *Hazelia*, appears to be confined to the Archipelago. Fifteen genera, all that are known from the Islands, are found in Mindanao; six of these have been discovered also in Luzon, and ten in Palawan. The five genera known from Luzon also occur in Celebes and Borneo, and two of them occur in Japan; the latter, however, are the widely spread genera *Rana* and *Polypedates*.

\* Casto de Elera lists *Hyla chinensis* Günther from Luzon and Basilan. This is probably incorrect.

TABLE 3.—*Distribution of the genera of Salientia that occur in the Philippine Islands.*

| Genus.                              | Oceania. | New Zealand. | Australia. | New Guinea. | Celebes. | Mindanao and Sulu. | Luzon. | Palawan. | Borneo. | Java. | Sumatra. | Malay Peninsula. | Southern Asia. | Central Asia. | Japan. | Europe. | North Africa. | South Africa. | Madagascar. | North America. | South America. |
|-------------------------------------|----------|--------------|------------|-------------|----------|--------------------|--------|----------|---------|-------|----------|------------------|----------------|---------------|--------|---------|---------------|---------------|-------------|----------------|----------------|
| <i>Oxyglossus</i> .....             |          |              |            |             | ×        | ×                  | ×      | ×        | ×       | ×     | ×        | ×                | ×              | ×             |        |         |               |               |             |                |                |
| <i>Rana</i> .....                   | ×        |              | ×          | ×           | ×        | ×                  | ×      | ×        | ×       | ×     | ×        | ×                | ×              | ×             |        |         |               |               |             |                | ×              |
| <i>Staurois</i> .....               |          |              |            |             | ?        | ×                  | ×      | ×        | ×       | ×     | ×        | ×                | ×              | ×             | ×      |         |               |               |             |                |                |
| <i>Polypedates</i> .....            |          |              |            |             | ×        | ×                  | ×      | ×        | ×       | ×     | ×        | ×                | ×              | ×             |        |         |               |               |             |                |                |
| <i>Hazelia</i> .....                |          |              |            |             |          | ×                  |        |          |         |       |          |                  |                |               |        |         |               |               |             |                |                |
| <i>Philautus</i> .....              |          |              |            |             |          | ×                  | ×      | ×        | ×       | ×     |          | ×                |                |               |        |         |               |               |             |                |                |
| <i>Cornufer</i> .....               | ×        |              | ×          | ×           | ×        | ×                  | ×      | ×        | ×       | ×     |          | ×                |                |               |        |         |               |               |             |                |                |
| <i>Microhyla</i> <sup>a</sup> ..... |          |              |            |             |          | ×                  |        |          | ×       | ×     | ×        | ×                | ×              |               | ×      |         |               |               |             |                |                |
| <i>Kaloula</i> .....                |          |              |            |             | ×        | ×                  | ×      |          | ×       | ×     | ×        | ×                | ×              | ×             |        |         |               |               |             |                |                |
| <i>Kalophrynus</i> .....            |          |              |            |             |          | ×                  |        | ×        | ×       |       | ×        | ×                | ×              | ×             |        |         |               |               |             |                |                |
| <i>Chaperina</i> .....              |          |              |            | ×           |          | ×                  |        | ×        | ×       |       |          |                  |                |               |        |         |               |               |             |                |                |
| <i>Phrynixalus</i> .....            |          |              |            | ×           |          | ×                  |        | ×        |         |       |          |                  |                |               |        |         |               |               |             |                |                |
| <i>Nectophryne</i> .....            |          |              |            |             |          | ×                  |        |          | ×       | ×     | ×        | ×                |                |               |        |         | ×             | ×             |             |                |                |
| <i>Bufo</i> .....                   |          |              |            |             | ×        | ×                  |        | ×        | ×       | ×     | ×        | ×                | ×              | ×             | ×      | ×       | ×             | ×             |             | ×              | ×              |
| <i>Megalophrys</i> .....            |          |              |            |             |          | ×                  |        | ×        | ×       | ×     | ×        | ×                | ×              |               |        |         |               |               |             |                |                |

<sup>a</sup> Very doubtful in the Philippine Islands.

New Guinea has four genera in common with Mindanao, all of which are also common to Borneo. Celebes has six genera in common with Mindanao, of which only two are found in New Guinea, while all of them are found in Borneo.

Thus, of the fifteen genera, only three might be regarded as having been derived from New Guinea; these are *Phrynixalus*, *Chaperina*, and *Cornufer*. It is significant, however, that single representatives of these three genera are known in Borneo. Eleven of the genera, which are for the most part southern Asiatic or Malayan in distribution, have undoubtedly entered our territory from Borneo through the Sulu and Palawan groups.

#### DOUBTFUL SPECIES AND SPECIES ERRONEOUSLY CREDITED TO THE PHILIPPINE ISLANDS

Due to incorrect labeling and incorrect identification some species have been erroneously credited to the Philippine Islands. The following records are open to question:

*Oxyglossus lima* Tschudi.

Reported by Casto de Elera, Cat. Fauna Filipinas 1 (1895) 445, from "Luzon, Abra, Cagayan," with specimen in Santo Tomás University collection. No specimen exists in that museum at the present time.

***Rana chalconota* Schlegel.**

Reported by Casto de Elera (op. cit.) as *R. chalconata* Gthr. from "Paragua, Inagauan, Bulacan," with specimens in Santo Tomás Museum. No specimen exists in the museum at the present time. Barbour, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 67, also mentions this species as occurring in the Philippines. He does not state his authority, and I have overlooked the original reference.

***Rana signata* Günther.**

Boulenger is of the opinion that *Rana similis* Günther is a synonym of this species. I have not followed him in this conclusion.

***Rana corrugata* Peters.**

Reported by Casto de Elera (op. cit.) from "Mindoro, Naujan, Ilocos," with specimens in Santo Tomás Museum. No specimen exists in that collection to-day.

***Rana kuhli* Duméril and Bibron.**

Reported by Casto de Elera from Paragua, Samar, and Borongan, with specimens in Santo Tomás Museum. No specimen of this species exists in that collection to-day.

***Rana varians* Boulenger.**

This species is very probably a synonym of *R. sanguinea* Boettger.

***Rana macrodon* Tschudi.**

This species has long been confused in the Philippine Islands with *R. magna* Stejneger. The presence of vocal sacs in the latter species clearly differentiates it from *R. macrodon*.

***Rana gracilis* Wiegmann.**

This species is reported by Casto de Elera (op. cit.) from "Samar, Villareal," with specimens in Santo Tomás Museum. No specimen exists in that collection at the present time.

***Rana guentheri* Boulenger.**

Reported by Casto de Elera (op. cit.) from "Paragua, P. Princesa, Mindoro, Naujan," with specimens in Santo Tomás Museum. No specimen of this species is there at present.

***Rana macrodactyla* Günther.**

Reported by Casto de Elera (op. cit.) from Luzon, Laguna, Cagayan, Dinagat, Negros, Zamboanga, and Mindanao, with specimens in Santo Tomás Museum. No specimen of this species is in the museum at present.

***Rana jerboa* Günther.**

Reported by Casto de Elera (op. cit.) from "Samar, Loquilocum," with specimens in Santo Tomás Museum. No specimen is there at present.

***Rana luctuosa* Peters.**

Reported by Casto de Elera (op. cit.) from "Mindanao, Butuan," with specimens in the Santo Tomás Museum. No specimen of this species is there at the present time.

**Rhacophorus rizali Boettger.**

According to Boulenger, this species is synonymous with *Polypedates pardalis* Günther, an opinion in which I concur.

**Ixalus pictus Peters.**

Reported by Casto de Elera (op. cit.) from Paragua.

**Nectophryne sundana Peters.**

This problematic species of Peters has been included in the Fauna by Müller, III Nachtr. Cat. Herp. Samml. Basel. Mus. (1883) 7. The locality given is Mindanao. On the statement of Jean Roux, Proc. Zool. Soc. London 1 (1906) 64, the type is the only specimen extant. Evidently Müller's specimen has received another designation. The type of this species, as well as the specimen studied by Müller, should be reexamined and the status of the name permanently fixed.

**Nectophryne guentheri Boulenger.**

Listed from Mindanao by Casto de Elera; no specimen is now in Santo Tomás Museum.

**Bufo divergens Peters.**

The species reported from Palawan under this name by Mocquard, Nouv. Arch. Mus. 2 (1890) 153, is regarded by Boulenger, Ann. & Mag. Nat. Hist. VI 14 (1894) 88, as synonymous with *Bufo philippinicus* Boulenger, an opinion in which I concur.

**Bufo biporcatus Günther.**

Reported by Casto de Elera from Luzon, Manila, Batangas, and San Pablo, with specimens in the Santo Tomás Museum.

**Bufo panayensis Seaone.**

This species and a snake, *Piesigaster boettgeri* Seaone, were reported as originating in Panay. As a matter of fact, they are both West Indian species; the toad is *Bufo lemur*, and the snake is *Epicrates inornatus* Reinhardt.

**Hyla chinensis Günther.**

This species is reported by Casto de Elera from Luzon and Basilan, with specimens in Santo Tomás Museum.

**Hyla daactylus pictus Bibron.**

Reported by Casto de Elera from "Luzon, Bulacan." A synonym of *Kaloula picta*?

**Molge sinensis Boulenger.**

Reported by Casto de Elera from "Luzon, Cagayan, Pamplona."

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BARBOUR, THOMAS. A contribution to the zoögeography of the East Indian Islands. Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 1-203; 8 plates.

In the distributive tables twenty-one frogs are attributed to the Philippines. *Rana signata* and *R. chalconota* are included in the list.

BOETTGER, OSKAR. Aufzählung der von den Philippinen bekannten Reptilien und Batrachier. Ber. Senck. Nat. Ges. (1886) 91-134.

A check list of crocodiles, turtles, lizards, snakes, and frogs. The list contains the names of twenty-seven frogs, based on records of other authors.

BOETTGER, OSKAR. Drei neue Wasserfrösche (*Rana*) von den Philippinen. Zool. Anz. 16 (1893) 363-367.

*Rana moellendorffi*, from Culion; *R. sanguinea*, from Culion; and *R. leytenensis*, from Leyte, are described as new. The first two appear to have been collected by Moellendorff, the last by José Quadras.

BOETTGER, OSKAR. Neue Reptilien und Batrachier von den Philippinen: Zool. Anz. 20 (1897) 161-166.

*Calophrynus acutirostris* (= *Kalophrynus acutirostris*) is the new batrachian described. The type locality is "Culion oder Samar;" collected by Moellendorff.

BOULENGER, G. A. Catalogue of the Batrachia Gradientia Salientia and S. E. Caudata in the Collection of the British Museum, ed. 2 London (1882) i-xvi + 1-503; 30 plates and numerous text figures.

This splendid work has stood as a basis for much of the recent work on the Amphibia. Two new species are described from the Philippines; namely, *Rana everetti*, from Zamboanga, and *Cornufer guentheri*, from Dinagat. The types were collected by A. Everett. Drawings are given of these two species, as well as of *Cornufer meyeri*, *Rana glandulosa*, and *Polypedates appendiculatus*, which are also found in the Philippines. *Rana mindanensis* is regarded as an uncertain species. The following species are listed from the Philippines:

*Oxyglossus laevis* Günther.

*Rana erythraea* Schlegel.

*Rana macrodon* Tschudi (= probably *Rana magna* Stejneger).

*Rana natatrix* Günther (= *Staurois natator* Günther).

*Rana similis* Günther.

*Rhacophorus hecticus* Peters (= *Polypedates hecticus* Peters).

*Rhacophorus surdus* Peters (= *Polypedates surdus* Peters).

*Rhacophorus pardalis* Günther (= *Polypedates pardalis* Günther).

*Rhacophorus appendiculatus* Günther (= *Polypedates appendiculatus* Günther).

*Rhacophorus maculatus* Gray and var. *quadrilineata* Wiegmann (= *Polypedates leucomystax* Gravenhorst).

*Ixalus acutirostris* Peters (= *Philautus acutirostris* Peters).

*Cornufer corrugatus* A. Duméril.

*Cornufer jagori* Peters.

*Cornufer meyeri* Günther.

*Callula picta* Bibron (= *Kaloula picta* Bibron).

*Callula conjuncta* Peters (= *Kaloula conjuncta* Peters).

*Callula baleata* Müller (= *Kaloula baleata* Müller).

*Bufo brevipes* Peters.

*Bufo melanostictus*.

*Megalophrys montana* Kuhl (= *Megalophrys* species?).

BOULENGER, G. A. On new batrachians from Malacca. Ann. & Mag. Nat. Hist. V 19 (1887) 345-348, pl. 10.

Describes *Bufo philippinicus* as new, from Puerto Princesa, Palawan; the type was collected by Everett.

BOULENGER, G. A. Descriptions of new reptiles and batrachians in the British Museum (Natural History)—Part III. Ann. & Mag. Nat. Hist. V 20 (1887) 50-53.

*Bufo muelleri* is described as new from Mindanao, P. I. The type specimen was sent to Boulenger by F. Müller, of the Basel Museum.

BOULENGER, G. A. On the herpetological fauna of Palawan and Balabac. Ann. & Mag. Nat. Hist. VI 14 (1894) 18-90.

This important contribution lists one turtle, seven lizards, sixteen snakes, and thirteen batrachians. *Rana palawanensis*, *Rana varians* (= *Rana sanguinea* Boettger), *Rhacophorus everetti* (= *Polypedates everetti*), and *Ixalus longicrus* (= *Philautus longicrus*) are described as new. *Rana glandulosa* Boulenger, *Rhacophorus macrotis* Boulenger (= *Polypedates macrotis* Boulenger), and *Leptobrachium hasselti* Tschudi (= *Megalophrys hasselti* Tschudi) are reported from the Philippines for the first time. Specimens and types were collected by Everett. *Rana macrodon* is included, but the species so identified by him was probably *Rana magna* Stejneger, with vocal sacs.

BOULENGER, G. A. Descriptions of new batrachians in the British Museum. Ann. & Mag. Nat. Hist. VI 17 (1896) 401-406, pl. 17.

• *Rana luzonensis* is described as new from Lepanto, northern Luzon, P. I. The type was collected by John Whitehead.

BOULENGER, G. A. A catalogue of the reptiles and batrachians of Celebes, with special reference to the collections made by Drs. P. and F. Sarasin in 1893-1896. Proc. Zool. Soc. London (1897) 193-237, pls. 7-11.

Discusses several species found in the Philippines and treats of faunal relations.

CASO DE ELERA. Catalogo sistemático de toda la fauna de Filipinas conocida hasta el presente, y á la vez el de la colección zoológica del museo de PP. Dominicos del Colegio-Universidad de Sto. Tomás de Manila, escrito con motivo de la exposición regional filipina. Manila, Imprenta del Colegio de Santo Tomás (1895-1896) 3 vols.

Volume 1 treats of vertebrates; amphibians, pages 445 to 454. The following species listed are regarded as doubtful or incorrect:

|                                   |  |
|-----------------------------------|--|
| <i>Oxyglossus lima</i> Günther.   | <i>Rana</i> sp.                            |
| <i>Rana corrugata</i> Peters.     | <i>Ixalus pictus</i> Peters.               |
| <i>Rana kuhlii</i> Günther.       | <i>Nectophryne guentheri</i> (Boulenger).  |
| <i>Rana macrodon</i> Günther.     | <i>Nectophryne?</i> <i>sundana</i> Peters. |
| <i>Rana tigrina</i> Günther.      | <i>Bufo biporcatus</i> Günther.            |
| <i>Rana gracilis</i> Wiegmann.    | <i>Bufo panayensis</i> Seane.              |
| <i>Rana guentheri</i> Boulenger.  | <i>Hyla chinensis</i> Günther.             |
| <i>Rana macrodactyla</i> Günther. | <i>Hyledactylus pictus</i> Bibron.         |
| <i>Rana chalconata</i> Günther.   | <i>Molge sinensis</i> Boulenger.           |
| <i>Rana jerboa</i> Günther.       | <i>Ichthyophis monochrous</i> Peters.      |
| <i>Rana luctuosa</i> (Peters).    |  |

FISCHER, J. G. A list of reptiles and batrachians of Mindanao. Jahrb. Wiss. Anst. Hamburg 2 (1885) 80 and 81.

Lists *Hylorana erythraea* Schlegel (= *Rana erythraea* Schlegel), *Rana everetti* Boulenger, *Megalophrys montana* Kuhl, and *Microhyla achatina* Boie. The last two records may be considered doubtful.

GIRARD, CHARLES. United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes,

U. S. N. Herpetology 20 (1858) i-xvii + 1-496, with folio atlas of plates.

Two Philippine frogs are listed. *Hylorana mindanensis* (= *Rana mindanensis*) is described on page 52 as new, from Caldera, Zamboanga, Mindanao.

GÜNTHER, ALBERT. Catalogue of the Batrachia Salientia in the Collection of the British Museum. London (1858) i-xvi + 1-160, pls. 1-13.

In this early catalogue the following new species are described from the Philippines: *Oxyglossus lævis*, from "Philippine Islands," *Ixalus natator* (= *Staurois natator*), from the "Philippines," *Rhacophorus pardalis* (= *Polypedates pardalis*), from "Philippines" and Borneo, and *Polypedates appendiculatus*. *Platymantis plicifera* is also described as new from the Philippines, but this species is the same as *Cornufer corrugata* A. Duméril. Excellent drawings of all these species, except *P. appendiculatus*, are given. The types were collected (very probably) by Hugh Cuming.

GÜNTHER, ALBERT. Notes on some reptiles and batrachians obtained by Dr. Adolph Bernhard Meyer in Celebes and the Philippine Islands. Proc. Zool. Soc. London (1873) 165-172, pls. 17 and 18.

Several snakes and lizards are described. Two frogs, *Polypedates similis* (= *Rana similis*) and *Platymantis meyeri* (= *Cornufer meyeri*), are described as new from "Laguna de Bay."

GÜNTHER, ALBERT. List of the mammals, reptiles, and batrachians sent by Mr. Everett from the Philippine Islands. Proc. Zool. Soc. London (1879) 74-79.

Seven species are listed from Dinagat or Surigao.

MOCQUARD, M. F. Recherches sur la faune herpétologique des îles de Bornéo et de Palawan. Nouv. Arch. du Mus. d'hist. Nat. 2 (1890) 115-165.

Four frogs are listed, and *Ixalus nubilus* is described as new. This is now regarded as identical with *Staurois natator* Günther. *Bufo divergens* Peters and *Megalophrys montana* Kuhl are listed, but these are probably identical with *B. philippinicus* Boulenger and *M. ligayæ* Taylor.

MÜLLER, F. III. Nachtrag Katalog der herpetologischen Sammlung des Basler Museums (1883).

A few Philippine species are mentioned, among which are *Nectophryne sundana* Peters and *Megalophrys montana* Kuhl. These are very probably incorrectly identified.

PETERS, W. Mittheilungen über neue Batrachier. Monatsb. Ak. Wiss. Berlin (1863) 445-470.

Among other batrachians from the Philippines the following frogs are described as new, three of which belong to the Ranidæ and one to the Brevicipitidæ: *Hylædactylus* (*Holonectus*) *conjunctus* (= *Kaloula conjuncta*), from Luzon; *Halophila jagorii* (= *Cornufer jagori*), from Samar; *Polypedates hecticus*, from Loquilocum, Samar; and *Polypedates surdus*, from Luzon. The types of these species were collected by F. Jagor.

PETERS, W. Herpetologische Notizen. Monatsb. Ak. Wiss. Berlin (1867) 13-37.

Describes, among others, specimens from the collections made by Carl Semper in the Philippines. Nine lizards and two snakes are

recorded or described as new from the Philippines. The following frogs are described as new: *Ixalus acutirostris* (= *Philautus acutirostris*), from eastern Mindanao; *Leptomantis bimaculata* (= *P. bimaculatus*), from upper Agusan Valley, Mindanao; and *Hylaplesia brevipes* (= *Bufo brevipes*), from Zamboanga, Mindanao. The new genus described, *Leptomantis*, the type of which is *Leptomantis bimaculata*, is no longer recognized as distinct from *Philautus*.

STEJNEGER, LEONHARD. Two new species of toads from the Philippines. Proc. U. S. Nat. Mus. 33 (1903) 573-576.

*Phrynixalus anulatus*, from Davao, Mindanao, and *Kalophrynus stellatus*, from Basilan, are described as new. The types were collected by E. A. Mearns.

STEJNEGER, LEONHARD. Three new frogs and one new gecko from the Philippine Islands. Proc. U. S. Nat. Mus. 28 (1905) 343-348.

The following species are described as new: *Rana mearnsi*, from eastern Mindanao; *Cornufer worcesteri* and *Philautus woodi*, from Mount Apo, Mindanao. The gecko described is *Lepidodactylus planicaudus*. The types were collected by E. A. Mearns.

WIEGMANN, A. F. A. Amphibien. Nova Acta Acad. Leop.-Carol. (1835) 225-261, pls. 21, 22.

*Rana vittigera* is described as new from Laguna de Bay and *Hyla quadrilineata* Boie (= *Polypedates leucomystax* Gravenhorst) is described from a Manila specimen. Both species are figured.

#### CLASSIFICATION

### Class AMPHIBIA Linnæus

Stejneger \* has shown that the long-accepted name Batrachia, as usually applied to this class, is merely a synonym of the much older name Amphibia. It consists of three recognized orders as follows:

1. No legs; tail rudimentary; males with intromittent copulatory organ. Apoda.
2. Two or four legs; tail present; no intromittent organ..... Caudata.
3. Four legs; no tail; no intromittent organ..... Salientia.

Representatives of two of these orders, the Apoda and the Salientia, occur in the Philippines, while the Caudata are of very doubtful occurrence. Only a single species of the first order is known from the Philippines. It is a small wormlike animal and has been found only in Palawan. A species of the second order has been reported by Casto de Elera,† but I regard this as somewhat doubtful.

On two occasions I was told of the occurrence of a salamander-like amphibian in Cagayan Valley, and I obtained what appeared to be salamander eggs in a small stream on Mount Maquiling,

\* Bull. U. S. Nat. Mus. 58 (1907) 2.

† Cat. Fauna Filipinas 1 (1895) 453. *Molge sinensis* Boulenger.

Laguna Province, Luzon. The eggs were surrounded by a thick gelatinous mass. Because of lack of preservative the material deteriorated before study was possible.

It is significant that the Philippine locality given for Casto de Elera's specimen is "Luzon, Cagayan, (Pamplona)." There is no specimen in Santo Tomás Museum at present. If Casto de Elera had a Philippine specimen of a salamander, I doubt greatly that it was *Molge sinensis*. It is quite probable that a new species awaits discovery.

The third group, Salientia, includes all the frogs and toads. It is a large group, represented in the Philippines by four families; namely, Ranidæ, Brevicipitidæ, Bufonidæ, and Pelobatidæ, each with several representatives, although the first is by far the largest family.

### Order APODA

"No limbs. Tail rudimentary or absent. Frontal bones distinct from parietals; palatines fused with maxillaries. Males with an intromittent copulatory organ." (*Boulenger*.)

This order consists of a single family.

### CÆCILIIDÆ

The characters of the family are the same as those of the order. Many genera are known, but only *Ichthyophis* has been found in Philippine territory. These small batrachians were formerly regarded as snakes. They are small, legless, snake-like, burrowing creatures.

#### Genus ICHTHYOPHIS Fitzinger

*Ichthyophis* FITZINGER, Neue Class. Rept. (1826) 36; GRAY, Cat. Spec. Amph. Brit. Mus. II (1850) 60; PETERS, Mon. Berl. Ak. (1879) 931; BOULENGER, Cat. Batr. Grad. Brit. Mus. ed. 2 (1882) 89; Fauna Brit. India, Rept. (1890) 515.

*Epicrura* WAGLER, Isis (1828) 743; Nat. Syst. Amph. (1840) 198; TSCHUDI, Class. Batr. (1838) 90; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 285 and 288.

*Rhinatrema* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 288.

Squamosal bones in contact with parietals; two series of teeth in upper jaw; usually two series of teeth in lower jaw; tentacle cultriform, exsertile, between eye and nostril; cycloid scales embedded in skin.

Three species are known, only one of which is Philippine.

#### ICHTHYOPHIS WEBERI Taylor

*Ichthyophis weberi* TAYLOR, Philip. Journ. Sci. 16 (1920) 227.

*Type*.—No. B1, Bureau of Science collection; collected at Matagan River, Palawan, January 28, 1909, by C. M. Weber.

*Description of type.*—Two rows of teeth in upper jaw, the series forming oval arches, parallel to each other, the inner row extending much farther back than the outer but not widening; lower jaw with a single row of teeth, with no evidence of a second row; head oval, eyes distinct, the distance between them very slightly less than width of head between eyes; distance between eyes a little greater than length of snout; tentacle withdrawn, the groove rather moon-shaped, situated anterior to eye near the edge of upper jaw; body surrounded by three hundred twenty-four circular folds meeting on belly in an angle, except those on posterior part of body, which run straight across without an angle; the first three or four folds on anterior part of body fail to meet; a more or less distinct groove from tip of lower jaw to some distance in front of anus along the median ventral line of body.

*Color in alcohol.*—Above yellowish brown, somewhat darker on median part of body; below lighter yellowish brown. Under a microscope the color appears as minute, rounded yellowish dots surrounded by a network of brown. A white spot on tip of lower jaw.

*Measurements of Ichthyophis weberi Taylor.*

|                       | mm. |
|-----------------------|-----|
| Total length          | 250 |
| Tail                  | 2.5 |
| Width of head at eyes | 7.5 |
| Length of snout       | 5   |
| Eye to nostril        | 3.5 |
| Eye to tentacle       | 1.5 |

*Remarks.*—This species differs from the two other known species in the absence of the secondary row of teeth in the lower jaw. I do not think that this fact warrants the making of a new genus, since we find that the second series of teeth appears to be degenerating, even in *Ichthyophis monochrous*. A single specimen was collected in Palawan by C. M. Weber. I take pleasure in naming this species for Mr. Weber, whose untiring efforts have greatly enriched the natural-history collections of the Bureau of Science.

### Order SALIENTIA

Four limbs present; tail not present except in larval form; no intromittent organ; body short, more or less depressed. Two suborders are recognized, characterized as follows:

*Key to the suborders of the Salientia.*

- α<sup>1</sup>. Tongue present; separate inner ear openings..... Phaneroglossa.
- α<sup>2</sup>. Tongue absent; a single opening to the Eustachian tubes..... Aglossa.

## Suborder PHANEROGLOSSA

Only the suborder Phaneroglossa is represented in the Philippines. It is usually divided into two groups, each of which is represented by two families in the Philippines.

*Key to the Philippine families of the Phaneroglossa.*

- a*<sup>1</sup>. Coracoids united by a simple epicoracoid cartilage; precoracoids resting with their distal extremity on the coracoid or connected with it by cartilage; precoracoid sometimes absent..... FIRMISTERNIA.
- b*<sup>1</sup>. Upper jaw toothed; diapophyses of the sacral vertebra not or only slightly dilated; precoracoids always present..... Ranidæ (p. 28).
- b*<sup>2</sup>. Upper jaw toothless; diapophyses of the sacral vertebra dilated; precoracoids present or absent..... Brevicipitidæ (p. 119).
- a*<sup>2</sup>. Coracoids and precoracoids connected by an arched epicoracoid cartilage, that of one side overlapping that of the other..... ARCIFERA.
- b*<sup>1</sup>. Jaws toothless; diapophyses of sacral vertebra dilated.  
Bufo<sup>n</sup>idæ (p. 138).
- b*<sup>2</sup>. Upper jaw toothed; diapophyses of sacral vertebra very strongly dilated ..... Pelobatidæ (p. 147).

## RANIDÆ

Upper jaw toothed; diapophyses of sacral vertebra not or but slightly dilated; sternal structure variable; precoracoids always present; vertebræ procœlian; coccyx attached to two condyles; no ribs; terminal phalanges assume a variety of shapes.

This family is represented in the Philippines by six long-recognized genera; namely, *Oxyglossus*, *Rana*, *Staurois*, *Polypedates*, *Philautus*, and *Cornufer*. A seventh generic name, *Hazelia*, has been proposed for a species recently discovered in Mindanao and Basilan, characterized by a spiny skin, the skin on the head partially involved in the cranial ossification, and bony ridges in the interparietal region.

The largest genus is *Rana*, which includes twenty-three species, or about four-ninths of the Philippine Ranidæ. This colossal cosmopolitan genus will undoubtedly have to be divided into two or more genera. Boulenger \* proposes to divide the group occurring in Papua and Melanesia into three subgeneric groups; namely, *Rana* s. str., *Discodeles* n. n., and *Hylorana* Tschudi, using the toe disks and the arrangement of the metatarsals as the basis for this division. Among the Philippine species there appear to be three natural divisions, characterized as follows:

1. Tips of toes not or but slightly dilated; no enlarged disks; no bony "teeth" in lower jaw. *Rana vittigera*, *R. moodiei*, and possibly, *R. parva*, belong to this group.

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\* Ann. & Mag. Nat. Hist. IX 1 (1918) 236-242.

2. Tips of toes more or less dilated into pads; enlarged "teeth" in lower jaw. *Rana magna* and *R. leytenensis* belong to this group.
3. Tips of toes dilated into regular disks, with a distinct groove around edge of each disk. To this group would be assigned most of the other known Philippine species of *Rana*.

The external distinctions between *Staurois* and *Rana* or between *Polypedates* and *Philautus* are scarcely more "generic" in nature than the obvious distinctions pointed out between the various groups of *Rana*. Barbour states, speaking of *Philautus pallidipes* Barbour:

The small size (body one inch long for nearly adult female), lack of cranial ossification, the absence of vomerine teeth place this form with the genus *Ixalus*. The fact, however, that two species of *Polypedates* have been discovered, viz. *P. edentulus* (F. Müller) and *P. anodon* (Van Kampen) which also lack vomerine teeth, shows how scant is the basis of separation for the two genera. Cranial ossification is unknown in *Ixalus* and, of course, is not general in *Polypedates* so that the adult size alone stands as the generic distinction. A very slim one surely.\*

The Ranidæ are the so-called true frogs. They are not known to be poisonous and for the most part are edible. Many of the species are large enough to be of commercial value and are found frequently in Philippine markets. The larger species are bred on farms in various parts of the world and sell for high prices. The clear white flesh is considered a great delicacy. The manufacture of fine leather from frog skins is an industry of considerable importance in Japan.

The Philippine species that appear to attain the largest sizes are *Rana vittigera*, *R. magna*, and *R. moodiei*. Some specimens of these species in the collection have a body length of 13 centimeters and the hind legs measure 16.4 centimeters, making a total length of nearly 30 centimeters. Doubtless they grow to even larger sizes.

The largest species known in the world appears to be *Rana goliath* Boulenger, from Africa, which attains a body length of about 30 centimeters, with legs nearly 35 centimeters long, or a total of 65 centimeters (nearly 2 feet 2 inches).

*Key to the Philippine genera of the Ranidæ.*

- a<sup>1</sup>. Tongue entire; fingers free, toes webbed; tympanum indistinct; very small or no disks on digits; no vomerine teeth. *Oxyglossus* Tschudi (p. 30).
- a<sup>2</sup>. Tongue more or less deeply nicked behind.
  - b<sup>1</sup>. Vomerine teeth present; fingers perfectly free; no intercalated bone between last two phalanges; toes more or less webbed; outer metatarsals separated by a web; with or without disks on tips of digits..... *Rana* Linnæus (p. 32).

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\* Proc. Biol. Soc. Washington 21 (1908) 190.

- b<sup>3</sup>. Vomerine teeth present or absent; a small intercalated bone between last two phalanges of digits; terminal phalanges T-shaped; outer metatarsals separated by a web.
- c<sup>1</sup>. Vomerine teeth present or absent; tympanum distinct; fingers free, toes webbed, disks large..... *Staurois* Cope (p. 77).
- c<sup>2</sup>. Vomerine teeth usually present; fingers more or less webbed; toes webbed; disks present; skin of head sometimes involved in cranial ossification..... *Polypedates* Tschudi (p. 80).
- c<sup>3</sup>. Vomerine teeth wanting; fingers free, toes webbed; disks present; head with bony ridges; skin of head involved in cranial ossification.  
*Hazelia* Taylor (p. 93).
- c<sup>4</sup>. Vomerine teeth wanting; fingers free or webbed; toes webbed, disks present; skin on head not involved in cranial ossification.  
*Philautus* Gistel (p. 96).
- b<sup>3</sup>. Vomerine teeth present; no intercalated bone between last two terminal phalanges; fingers free; toes usually free, sometimes slightly webbed; outer metatarsals united or separated by a groove; terminal phalanges T-shaped..... *Cornufer* Tschudi (p. 108).

### Genus OXYGLOSSUS Tschudi

*Oxyglossus* TSCHUDI, Class. Batr. (1838) 35; DUMÉRIL and BIBRON, *Erp. Gén.* 8 (1841) 332; GÜNTHER, *Cat. Batr. Sal. Brit. Mus.* (1858) 6; COPE, *Nat. Hist. Rev.* (1865) 117; BOETTGER, *Ber. Senck. Nat. Ges.* (1886) 121; BOULENGER, *Cat. Batr. Sal. Brit. Mus. ed.* 2 (1882) 5; *Fauna Brit. India, Rept.* (1890) 436.

*Microdiscopus* PETERS, *Mon. Berl. Ak.* (1877) 422.

"Pupil horizontal. Tongue narrow, entire, and free behind. Vomerine teeth none. Tympanum indistinct. Fingers free; toes webbed, the tips not dilated into regular disks. Outer metatarsals separated by a web. Omosternum with a bony style; sternum a cartilaginous plate. Terminal phalanges simple." (*Boulenger.*)

Three species of this genus are known, only one of which appears to enter our territory. A second is included in Casto de Elera's list, but the specimen reported to be in the Santo Tomás University collection is no longer extant.

### OXYGLOSSUS LÆVIS Günther

#### PLATE 1, FIG. 1

*Oxyglossus lævis* GÜNTHER, *Cat. Batr. Sal. Brit. Mus.* 7 (1858) pl. 1, fig. A; *Rept. Brit. India* (1864) 401; BOULENGER, *Cat. Batr. Sal. Brit. Mus. ed.* 2 (1882) 6; *Fauna Brit. India, Rept.* (1890) 437; *Proc. Zool. Soc. London* (1897) 228; STOLICZKA, *Journ. As. Soc. Bengal* (1870) 273; (1872) 101; BOETTGER, *Ber. Senck. Nat. Ges.* (1886) 121; BOULENGER, *Ann. & Mag. Nat. Hist.* VI 14 (1894) 85.

*Microdiscopus sumatranus* PETERS, *Mon. Berl. Ak.* (1877) 422, 682.

*Description of species.*—(From No. 1236, E. H. Taylor collection; collected at Hinigaran, Occidental Negros, March,

1915, by E. H. Taylor.) No vomerine teeth; choanæ small, round, not widely separated; tongue regularly oval, rounded behind; no canthus rostralis; head broader than long; loreal region sloping very obliquely to mouth; nostrils halfway between eye and end of snout, the distance between them greater than their distance from eye; interorbital region narrow, much less than a single eyelid; eye moderately small, its diameter less than length of snout; tympanum covered with skin, its outline dim, its diameter less than eye; skin above granular, striated, corrugated or with small tubercles; chin roughly granular, with a series of dim glandular tubercles forming two longitudinal parallel rows, which run from point of lower jaw to breast, where they meet a row of small glands, which cross the neck to near angle of mouth and go above arm to some distance on side; belly finely granular; anal region and underside of thighs granular; a straight supratemporal fold from eye to behind angle of mouth; parietal regions somewhat swollen; arms short, thick; fingers short with tips not as wide as fingers; palm with two prominent tubercles, that on first finger largest; first finger slightly longer than third or second; hind legs short and thick; toes with small disks, a little wider than toes; toes webbed to base of disks, very slightly incised between digits; subarticular tubercles small; a sharply defined inner metatarsal tubercle about one-third the length of first toe; no outer metatarsal tubercle; a skin fold on outer side of first and fifth toes, that on first toe continued on tarsus. Male with internal subgular vocal sac. The tibiotarsal articulation reaches snout.

*Color in life.*—Above black-brown, with a dull yellow stripe from snout to anus; sides lighter, mottled brown; belly, chin, and underside of legs dirty cream, more or less spotted or mottled with dark brown.

*Measurements of Oxyglossus lævis Günther.*

|                              | mm.  |
|------------------------------|------|
| Length, snout to vent        | 61   |
| Length of head               | 19   |
| Width of head                | 20.5 |
| Length of snout              | 7.5  |
| Diameter of tympanum (about) | 5    |
| Diameter of eye              | 6    |
| Foreleg                      | 27   |
| Longest finger               | 11   |
| Hind leg                     | 93   |
| Femur                        | 23   |
| Tibia                        | 21.5 |
| Longest toe                  | 22   |

*Variation.*—The variation in color is marked; some specimens in my collection are dull reddish brown above and white below, with a few scattered markings on legs; one specimen examined is uniform gray, yellowish below; hind legs dark above, light below, mottled and spotted darker. A Mindanao specimen is grayish, with a hair line on back with two dark stripes on each side; arms and legs barred with darker; the small tubercles on hind legs tipped with yellowish. The rows of glands on neck are scarcely visible in preserved specimens, but are distinct in living frogs.

*Remarks.*—The frogs of this species are thoroughly aquatic in habit and are usually found in water. They sit in the edges of the pools, only the snout and part of the head emerging. On the slightest disturbance they disappear below the surface, where they remain for a considerable time. A search among leaves and mud at the bottom of small pools often revealed specimens whose presence was only suspected. These frogs appear to be found everywhere in the Philippines. Specimens were collected by H. Otley Beyer at Banaue, Mountain Province, at an elevation of 1,800 meters. They are known from Luzon, Samar, Leyte, Mindanao, Dinagat, Basilan, Sulu Archipelago, Negros, Panay, Mindoro, Palawan, and Busuanga; also from Celebes, Borneo, Sumatra, Malay Peninsula, and Burma. The two types in the British Museum are females, both from the Philippines; the exact type locality is no longer known.

#### Genus *RANA* Linnæus

*Rana* LINNÆUS, Syst. Nat. ed. 10 1 (1758) 210; WAGLER, Nat. Syst. Amph. (1830) 203; TSCHUDI, Class. Batr. (1838) 78; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 335; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 8; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 6; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 93.

*Hylarana* TSCHUDI, Class. Batr. (1838) 78.

*Hylarana* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 71; Rept. Brit. India (1864) 423.

*Limnodytes* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 510.

*Polypedates* TSCHUDI, Class. Batr. (1838) 78; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 77.

“Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth. Tympanum distinct or hidden. Fingers free; toes webbed, with simple or dilated tips. Outer metatarsals separated by web. Omosternum and sternum with a strong

bony style. Terminal phalanges acute, transversely dilated or T-shaped." (*Boulenger.*)

Widely distributed, except in the southern parts of South America and in New Zealand. Absent in Australia, except in the northern part.

It has been necessary to eliminate from the Philippine list some species long regarded as occurring there, such as *Rana tigerina* Daudin and *R. macrodon* Kuhl. Stejneger \* recognized that the large-toothed species of the Philippines is distinct from *R. macrodon* and named it *R. magna*. *Rana vittigera* and *R. moodiei* have long been confused with *R. tigerina*, but the characters which obtain in the first two groups show clearly that they are very distinct from *R. tigerina*.

It was with great hesitancy that I united the two species, *Rana varians* Boulenger and *R. sanguinea* Boettger. I have not examined the types, but a comparison of the type descriptions shows no differences warranting separation. My opinion was confirmed by a comparison of specimens from the Calamianes and Palawan.

*Key to the Philippine species of Rana Linnæus.*

a<sup>1</sup>. No gland on upper arm.

b<sup>1</sup>. Fingers and toes not or but slightly dilated at tips; no bony teeth in lower jaw.

c<sup>1</sup>. Eyelid much wider than interorbital distance; no distinct canthus rostralis (large frog).

d<sup>1</sup>. A flap of skin on outer side of fifth toe and metatarsal.

*R. moodiei* Taylor (p. 35).

d<sup>2</sup>. No skin flap on fifth toe and metatarsal.

*R. vittigera* Wiegmann (p. 37).

c<sup>2</sup>. Eyelid about equal to interorbital space.

d<sup>2</sup>. Toes almost completely webbed; skin granular (small frog).

*R. mindanensis* (Girard) (p. 41).

d<sup>3</sup>. Toes about two-thirds webbed; a narrow dorsolateral fold.

*R. palavanensis* Boulenger (p. 43).

c<sup>3</sup>. Eyelid much narrower than interorbital space; skin smooth; toes one-half webbed (small frog)..... *R. parva* Taylor (p. 42).

b<sup>2</sup>. Fingers and toes distinctly dilated into small disks, without a groove around the edge; two well-developed bony teeth in the anterior part of lower jaw. Canthus rostralis distinct, angular.

c<sup>4</sup>. Toes entirely webbed; tympanum large, distinct; dorsolateral fold sometimes present in young (large frog).

*R. magna* Stejneger (p. 44).

\* Smithsonian. Misc. Coll. 52 (1908-10) 437.

- c<sup>2</sup>. Toes about two-thirds webbed; tympanum large; dorsolateral fold usually present (rather small frog)... *R. leytensis* Boettger (p. 47).
- b<sup>1</sup>. Fingers and toes dilated into regular disks with a transverse groove around disk; no bony mandibular teeth.
- c<sup>1</sup>. A broad glandular dorsolateral fold; tympanum equals four-fifths eye; canthus rostralis rounded; toes about four-fifths webbed.  
*R. erythræa* (Schlegel) (p. 50).
- c<sup>3</sup>. A narrow dorsolateral fold.
- d<sup>1</sup>. First finger shorter than second.
- e<sup>1</sup>. Snout truncate; finger disks large; tympanum three-fourths eye; canthus rostralis angular.... *R. mearnsi* Stejneger (p. 52).
- e<sup>2</sup>. Snout obtuse; tympanum about two-fifths eye; canthus rostralis angular..... *R. dubita* Taylor (p. 68).
- e<sup>3</sup>. Snout acutely pointed; tympanum about three-fourths eye.  
*R. luzonensis* Boulenger (p. 55).
- e<sup>4</sup>. Snout rather pointed; tympanum about one-third diameter of eye; an inner and an outer metatarsal tubercle.  
*R. guerreroi* Taylor (p. 56).
- d<sup>2</sup>. First finger equals second; toes three-fourths webbed; finger disks about one-half tympanum; snout rounded.  
*R. sanchezi* Taylor (p. 57).
- d<sup>3</sup>. First finger much longer than second; snout obtusely pointed; tympanum more than three-fourths eye; toes four-fifths webbed.  
*R. sanguinea* Boettger (p. 60).
- c<sup>3</sup>. No dorsolateral glandular fold.
- d<sup>1</sup>. First finger shorter than second; tympanum three-fourths eye.  
*R. everetti* Boulenger (p. 63).
- d<sup>2</sup>. First finger longer than second.
- e<sup>1</sup>. Diameter of tympanum three-fourths eye; first finger not opposed to others..... *R. suluensis* Taylor (p. 65).
- e<sup>2</sup>. Diameter of tympanum about three-fifths eye; first finger opposed to others..... *R. philippinensis* Taylor (p. 67).
- e<sup>3</sup>. Diameter of tympanum about three-fifths eye; first finger not opposed to others..... *R. melanomenta* Taylor (p. 69).
- a<sup>2</sup>. A gland present on upper arm; tips of toes swollen into small disks.
- b<sup>1</sup>. Interorbital area one and one-half times upper eyelid; tympanum about one-half eye. Islandlike dark spots on back.  
*R. moellendorffi* Boettger (p. 71).
- b<sup>2</sup>. Interorbital area equals eyelid; two lateral yellow stripes.  
*R. similis* (Günther)\* (p. 72).
- b<sup>3</sup>. Interorbital area one and one-third times eyelid, diameter of eye longer than snout; no lateral stripes.  
*R. grandocula* Taylor (p. 75).
- b<sup>4</sup>. Interorbital area equals eyelid; diameter of eye equals length of snout.  
*R. glandulosa* Boulenger (p. 76).

\* The gland on upper arm may be indistinct in this species or even entirely wanting.

## RANA MOODIEI Taylor

## PLATE 1, FIG. 5

*Rana moodiei* TAYLOR, Philip. Journ. Sci. 16 (1920) 234.

*Type*.—No. 1240, E. H. Taylor collection; collected at Manila, November, 1914, by E. H. Taylor.

*Description of type*.—Vomerine teeth in two strong oblique series, beginning on anterior inner edge of choanæ but extending a considerable distance behind them, separated from each other by a very slight distance; choanæ moderate, separated from each other by a distance a little larger than that between nostrils; no apophyses or "teeth" on anterior part of lower jaw; distance between Eustachian tubes about one-fifth longer than their distance from choanæ; length of head from angle of jaw only slightly greater than width of head at tympanum; eyes moderate, not extending to edge of outline of head when viewed from above, their diameter equal to their distance from snout; nostrils very distinctly nearer tip of snout than eye; tympanum large, distinct, about three-fourths diameter of eye; upper eyelid about one and one-half times interorbital distance; tympanum separated from eye by a distance equal to three-fourths its diameter; loreal region sloping broadly, not concave; canthus rostralis rounded or very indistinct; skin above extremely rugose with tubercles and folds of irregular length; a skin fold across occiput behind upper eyelids continuous with the angular folds from eye to arm above tympanum; a fold on posterior part of upper lip turning down at angle of jaw; a series of dorsolateral longitudinal folds not continuous, other shorter folds on sides and back; upper part of limbs with small tubercles; belly and throat smooth; underside of limbs and posterior part of thighs smooth, except in anal region; first finger longer than second and fourth; subarticular tubercles distinct; palmar tubercles, except that on base of first finger, very indistinct; tips slightly swollen; toes not more than three-fourths webbed, the web reaching near tip of fifth and outer side of third, a distinct flap of skin on outer side of fifth; a very strong, compressed, inner metatarsal tubercle, no outer; an indistinct tarsal fold from inner tubercle; tibiotarsal articulation reaches anterior corner of eye. Males with vocal sacs.

*Color in life*.—Above brownish olive, with very indistinct darker markings; sides rather lighter, yellowish, with dense,

darker reticulations; belly yellowish; large dark spots on upper labials.

*Measurements of Rana moodiei Taylor.*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 73   |
| Length of head        | 30   |
| Width of head         | 29   |
| Diameter of eye       | 9.5  |
| Diameter of tympanum  | 5.5  |
| Length of snout       | 12   |
| Eye to nostril        | 7.5  |
| Interorbital distance | 4    |
| Upper eyelid          | 5.8  |
| Foreleg               | 40   |
| Longest finger        | 15   |
| Hind leg              | 120  |
| Femur                 | 32.5 |
| Tibia                 | 34   |
| Foot and heel         | 55   |
| Longest toe           | 37   |

*Variation.*—Certain variations exist in this species. Mindanao specimens are greenish brown to brownish with darker spots, and the distance between the point of skin flap on the fifth toe to the inner metatarsal tubercle is greater than in Manila specimens. In certain specimens the skin is pulled tight across the occiput, and the transverse fold is scarcely noticeable. In none of the specimens (there are no less than forty in my collection and that of the Bureau of Science) is there a trace of the median dorsal stripe, a stripe on the tibia, or a diagonal lateral yellowish stripe; the skin flap is universally present. Males usually have large black spots on each side of the throat, the skin of which is sometimes in folds.

*Remarks.*—This species differs from *Rana vittigera* Wiegmann in much the same manner that *R. tigerina* Daudin differs from *R. limnocharis*; that is, in the presence of the flap of skin on the fifth toe. From *R. vittigera* it also differs in having a fold of skin across the head; the head broader in proportion to length; the eyes smaller and less prominent; the nostrils nearer tip of snout; and in the absence of stripes on the body. It differs from *R. tigerina* in the absence of "teeth" in the lower jaw, the more forward position of the nostrils, and the much less extent of webbing on toes.

The species is common in Mindanao, Luzon, and Negros, and probably occurs on many other islands. It is probable that cer-

tain records of *Rana tigerina* from the Philippines are referable to this species.

The breeding season for the species in Manila begins about July 10; it breeds in the same pools as does *Rana vittigera*. I am as yet unable to differentiate the tadpoles of the two species.

The species is named for my friend and former teacher, Dr. Roy Lee Moodie, associate in anatomy, University of Illinois, Chicago, noted for his extensive researches on extinct Amphibia of North America.

RANA VITTIGERA Wiegmann

PLATE 2, FIG. 3

*Rana vittigera* WIEGMANN, Nova Acta Acad. Leop.-Carol. (1836) 225, pl. 21, fig. 1.

*Rana tigrina* and *Rana tigerina* of various authors in the references of this species to the Philippines.\*

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\* It is highly probable that many of the references of *Rana tigerina* Daudin to the Philippines should be placed under this species, at least in part, since it is probable that specimens of *R. moodiei* have also been confused with it. I am confident that the Philippine specimen of *R. vittigera* Wiegmann (which was one of the types) belonged to the species here considered; the Macao specimen may be referable to *R. limnocharis*. In consequence I have resurrected Wiegmann's name. (Note distinctive characters under remarks.) My opinions regarding the treatment of this species are concurred in by Prof. S. F. Light, of the University of the Philippines, who for a number of years has used this species as well as *R. moodiei* for dissection and demonstration in his biological classes. Recent study by Boulenger and by Annandale of the allied Indian and Asiatic frogs has brought the subject of the identity of this group of species into the field of discussion. Boulenger, Rec. Ind. Mus. 15<sup>2</sup> (1918) 52 and 65, relying on Wiegmann's figures (op. cit.) and on the opinion of Peters, Mon. Berl. Ak. (1863-78), regards *Rana vittigera* Wiegmann and *R. rugulosa* Wiegmann as identical and makes them synonyms of *R. cancrivora* Gravenhorst which he first (p. 52) regards as a variety of *R. tigerina* and later (p. 65) as a distinct species. Annandale, Mem. As. Soc. Bengal 6 (1917) 126, identifies *Rana rugulosa* as a distinct species, and places *R. vittigera* as a questioned synonym of *R. cancrivora*. I formed my opinion concerning these forms before I had access to the two papers. The frog figured as *R. vittigera* Wiegmann (op. cit.) is beyond peradventure identical with the species here described under the same name. The absence of the loose flap of skin along the fifth toe, a character which is invariably found in descriptions of *R. tigerina* and allied species (or varieties), and I believe a good specific character, separates *R. vittigera* once and for all from this so-called *Rana tigerina* group. Doctor Annandale in a recent letter has suggested that I review the group in the light of these recent papers. When sufficient material is available, I may do so.

*Description of species.*—(From No. 1234, E. H. Taylor collection; collected at Manila, November, 1914, by E. H. Taylor.) Vomerine teeth in two oblique series beginning on anterior inner edge of choanæ and extending behind their posterior edge; tongue large, deeply notched, extensively free; (male with vocal sacs); distance between choanæ equals distance from eye to nostril; head longer than wide; snout rather pointed, tip rounded in lateral profile, slightly projecting; nostrils equidistant or slightly nearer tip of snout than eye; no canthus rostralis, the lores very slightly concave, sloping broadly to mouth; diameter of eye a little more than distance of eye to nostril; tympanum from one-half to two-thirds eye; distance from eye to tympanum equals about three-fifths the diameter of the latter; interorbital distance about half the width of an eyelid; skin above on back strongly rugose, with longer and shorter longitudinal folds, the spaces between distinctly granular; a strong angular fold from eye above tympanum to above foreleg; a short glandular fold from corner of mouth to above foreleg; sides granular, with short longitudinal folds on upper part; chin and throat smooth; belly smooth, except posterior part, which is slightly wrinkled and granular; anal region granular; fingers not, or but very slightly, swollen at tip, rather blunt; subarticular tubercles prominent; carpal tubercles indistinct; first finger extends considerably beyond second and fourth, no trace of skin fold on sides of inner fingers; toes from one-half to three-fourths webbed, the membranes failing to reach the tips, and deeply excised between digits; no free skin fringe on outer toe, but a mere indication of a skin fold; inner metatarsal tubercle small, compressed, its length about one-third that of first toe; no indication of an outer tubercle; tibiotarsal articulation reaches anterior corner of eye or slightly farther; interorbital region equals about one-half the distance between nostrils.

*Color in life.*—Above dark olive gray, with numerous, scattered, larger and smaller blackish spots on back, sides, and limbs; a prominent bar across head over posterior part of eyelids, and a prominent, broad W-shaped mark between shoulders; sides olive to yellowish brown with a dim, lighter, yellow-brown diagonal stripe from eye to near groin; axilla, underside of arm, groin, underpart of hind limbs, and upper side of foot, bright lemon to canary; belly whitish; throat dusky; lips above and below with dark spots; a loreal stripe present; underside of hand and foot rather purplish; posterior aspect of thigh black, reticulated with yellow lines.

*Measurements of Rana vittigera Wiegmann.*

|                                 | mm.  |
|---------------------------------|------|
| Length, snout to vent           | 95   |
| Length of head, to angle of jaw | 35   |
| Width of head                   | 30   |
| Length of snout                 | 15.5 |
| Diameter of eye                 | 10   |
| Diameter of tympanum            | 6.5  |
| Eye to nostril                  | 7.2  |
| Interorbital distance           | 4    |
| Upper eyelid, width             | 7    |
| Foreleg                         | 45   |
| Longest finger                  | 17   |
| Hind leg                        | 154  |
| Femur                           | 43   |
| Tibia                           | 46   |
| Foot                            | 66   |
| Longest toe                     | 45   |

*Variation.*—There is slight variation in the amount of webbing between the toes, and the toes are never fully webbed. In young specimens the toes are more pointed at the tip, while in older specimens they are blunter and sometimes swollen. The size of the tympanum varies, but is always more than one-half the diameter of the eye. Occasional specimens have the nostrils exactly halfway between tip of snout and eye. The number and arrangement of the longitudinal folds vary with each specimen. The arrangement of the vomerine teeth is quite constant; these teeth are usually larger and stronger in older specimens.

The color varies remarkably; about two-thirds of the two hundred specimens examined had a median, dorsal, greenish yellow or white stripe, from tip of snout to anus, varying in width from a stripe of 5 millimeters to a hair line. The diagonal line on the sides is invariably evident, often bright green or yellow, frequently dull and rather obscure. The ground color varies from grayish yellow to dark blackish brown; frequently in lighter specimens the dark spots are green; other specimens show the entire back a bright green. Many specimens have a narrow yellow line from knee to heel.\*

*Remarks.*—This species differs from *Rana tigerina*, with which it has frequently been confused, in the absence of the membrana-

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\* I am indebted to Prof. S. F. Light for several living specimens of this species, with numerous tadpoles; and for the privilege of examining a large quantity of living and preserved material at the University of the Philippines.

ceous fringe on the fifth toe; the absence of bony teeth or prominences in the lower jaw; and the lesser amount of webbing between the toes. Other less important differences are evident on a comparison of the two species. From *Rana limnocharis* it differs in its larger size, the more anterior arrangement of the vomerine teeth, and the absence of an outer metatarsal tubercle. They agree with each other in the absence of the fringe and the proportionally longer legs. From *Rana macrodon* and *R. modesta* Boulenger, it differs in the absence of large bony teeth, the absence of distinct disks on toes, and the lesser extent of the webbing. *Rana moodiei*, with which it is most frequently confused in the Philippines, has a membranaceous fringe on the fifth toe, but neither a dorsal nor a diagonal lateral stripe is ever present; the limbs are shorter in *R. moodiei*, the nostrils farther forward, and a fold is usually present between the posterior corners of the eyes across the head, at least in adult specimens. *Rana vittigera* is common in Luzon, and I have taken specimens in Mindoro and Negros. In the Bureau of Science collection there is a specimen from Polillo. It is found in the same localities and habitats as *R. magna* and *R. moodiei*. The breeding season at Manila begins about the first of July. The eggs are usually deposited in pools of water, left by rains.

*Tadpoles*.—Specimens of tadpoles of this species obtained July 17 measured as follows: Total length, 52 millimeters; snout to vent, 20; depth of tail fin, 10; hind legs, 11. Spiracle sinistral; distance between nostrils less than their distance from eye; nostrils nearer eye than tip of snout; mouth with short sucker-like distension; maxillary beak a heavy, regularly curved, black plate; plate in lower jaw rather angular medially; upper lip with a series of minute black teeth on its extreme outer edge, two shorter curved series, widely separated somewhat below it; lower lip rather lobulated on edge with three series of teeth on inner surface, the upper series longest, the lower shortest and widest.\*

*Color*.—Above greenish, with darker markings; usually a few specimens show a median lighter line on back and lateral, diagonal, yellowish green lines on sides; occasionally there is a blackish bar across interorbital region and eyelids; golden and green on sides and variegated golden on belly.

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\* It is significant that the tadpoles here described resemble the tadpole of *Rana cancrivora* described and figured by Annandale, Rec. Ind. Mus. 15<sup>1</sup> (1918) 64.

RANA MINDANENSIS (Girard)

*Hylarana mindanensis* GIRARD, Proc. Acad. Nat. Sci. Philadelphia 6 (1853) 423; U. S. Expl. Exp., Herpetology (1858) 52; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 6.

*Rana mindanensis* BOETTGER, Ber. Senck. Nat. Ges. (1886) 121; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 445.

*Description of species.*—"This appears to be the smallest species of its genus, the greatest length of the body and head together measuring but one inch, the head forming about the third of it, and is as long as broad. The upper surface of the head is almost flat, and, when viewed from above, ovoid in its outline. The snout is elevated, rounded, narrow, and quite prominent. The nostrils are conspicuous, and nearer the extremity of the snout than the anterior rim of the orbit. The space between the nostrils and eyes is subconcave, whilst the margin of the jaw constitutes a convex ridge. The eyes are proportionally large and prominent, subcircular in shape, their diameter being equal to the distance between their anterior rim and the extremity of the snout. The interocular space is equal to the greatest width of the upper lid, which, itself, is smooth like the surface of the head. The tympanum is situated very close to the eye, and is less in diameter than the latter. The tongue is large, fleshy, subelliptical; its posterior bifurcation being narrow and diverging. The inner nostrils are subcircular, of medium size, and situated near to the jaw-bone. The vomerine teeth are not very conspicuous, disposed upon two narrow, widely separated, elliptical groups or series, directed obliquely inwards and backwards from the posterior margin of the inner nostrils.

"The body is elongated, subcylindrical; the anterior limbs slender, shorter than the trunk; the posterior ones, comparatively well developed, longer than the body and head together, by the whole length of the foot. The fingers are subdepressed; the first is but very little longer than the second and fourth; the latter two being nearly equal. The palm of the hand exhibits ridges running in the direction of the fingers. The articulations of the latter are provided beneath with conspicuous though small knobs or tubercles, in every point similar to the swellings on the inferior surface of their extremities. The toes are webbed, very nearly to their tips, but the membrane is very deeply concave between all of them. The swellings at their extremities are larger than the tubercles under their articulations. There is but one metatarsal tubercle, situated at the base of the inner

toe, from which a horny ridge extends along the inner edge of the tarsus. The exterior ridge of the fifth toe is bordered by a membranous ridge, which, however, does not reach quite to its extremity. The skin above is minutely pustulous, and smooth beneath.

*Color*.—"The ground color is greenish-brown, uniform and lighter beneath. There are obsolete darker spots on the body as well as on the limbs. The margin of the upper jaw and sides of the head exhibit similar traces of maculæ." (*Girard*.)

*Remarks*.—Two specimens were captured "in the Caldera, on Mindanao" near Zamboanga. Boulenger regards this as a doubtful species. It has not been rediscovered.

#### RANA PARVA Taylor

##### PLATE 3, FIG. 4

*Rana parva* TAYLOR, Philip. Journ. Sci. 16 (1920) 241.

*Type*.—No. F409, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August, 1912, by E. H. Taylor.

*Description of type*.—Vomerine teeth in two elongate, oblique, converging series, beginning on inner side of choanæ and extending much beyond hinder level of choanæ, narrowly separated medially; choanæ small, rather hidden under edge of jaw; tongue oval, very slightly notched behind, the "horns" only slight rounded knobs, widely separated at their base; head and body flat above, head about as wide as long; eye distinctly less than length of snout; tympanum distinct, its diameter about two-thirds that of eye; nostril much nearer end of snout than eye; tympanum separated from eye by a distance equal to one-half its diameter; interorbital width one and one-half times upper eyelid; canthus rostralis distinct, rounded; loreal region with slight oblique slope; a slight depression behind nostrils, distance between nostrils much greater than their distance from eyes; skin on back smooth; on snout, sides, and upper side of limbs skin with numerous minute rounded depressions; chin, throat, and belly smooth; a very slight supratemporal fold above tympanum to near arm; no dorsolateral fold; fingers very slender, widened at tips into very small disks, slightly wider than the digits themselves; first finger distinctly longer than second, slightly longer than fourth; no skin fold on outer finger or on arm; toes one-third to one-half webbed, third toe barely longer than fifth; disks of toes slightly larger than those on fingers; subarticular tubercles moderate; an elongate, oval, inner metatarsal tubercle, more than a third

the length of first toe; no outer tubercle visible; no tarsal fold; tibiotarsal articulation reaches nostril.

*Color in life.*—Above uniform reddish brown on back, snout, and head, with very distinct darker areas interorbitally and between shoulders; sides of head and body darker brown than back, becoming almost black along the straight dorsolateral limit of the ground color of back, forming a distinct contrast; the ventrolateral area much lighter, with small yellowish spots; belly cream, chin densely powdered with cinnamon brown; arms and limbs brown, lightly barred with darker brown.

*Measurements of Rana parva Taylor.*

|                                 | Type.<br>mm. | Cotype.<br>mm. |
|---------------------------------|--------------|----------------|
| Length of head                  | 10.5         | 10             |
| Width of head                   | 10.1         | 10.2           |
| Diameter of eye                 | 3            | 3              |
| Diameter of tympanum            | 1.8          | 2.1            |
| Depth of snout, in front of eye | 3.3          | 3.3            |
| Length of snout                 | 4.2          | 4.2            |
| Foreleg                         | 15.5         | 15.5           |
| Longest finger                  | 6            | 5.9            |
| Hind leg                        | 47           | 46             |
| Femur                           | 14           | 14             |
| Tibia                           | 16           | 16.5           |
| Longest toe                     | 13.5         | 13             |

*Variation.*—A third specimen in my collection agrees fairly well in proportions with the other two, but is smaller. In this specimen the following differences in markings are evident: The ground color of the back is much lighter along the dorsolateral line; the sides are lighter with only a narrow dark line along the upper part; the chin and underside of limbs are somewhat more densely powdered with brown.

*Remarks.*—Three specimens are in my collection. They were taken in low mountains near Bunawan, Agusan, Mindanao. They may be related to Girard's species *Rana mindanensis*, of Mindanao, but they differ from it in a few essential points. In *R. mindanensis* the eyelid equals the interorbital region, and the toes are entirely webbed; the coloration also is different. Other differences are evident on a comparison of the two descriptions.

**RANA PALAVANENSIS Boulenger**

*Rana palavanensis* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 85; Proc. Zool. Soc. London (1897) 230.

*Description of species.*—"Vomerine teeth in two short oblique series commencing on a line with the hinder edge of the choanæ.

Head moderate, as long as broad; snout short, rounded, as long as the diameter of the orbit; canthus rostralis angular; loreal region slightly concave; nostril equidistant from the orbit and the end of the snout; interorbital space as broad as or a little narrower than the upper eyelid; tympanum distinct, three-fifths the diameter of the eye. Fingers moderate, the tips swollen or dilated into very small disks; first finger extending slightly beyond second; toes moderate, two-thirds webbed, the tips dilated into small but very distinct disks; subarticular tubercles moderate; inner metatarsal tubercle elliptical, flat, measuring two-fifths or one-half the length of the inner toe; no outer metatarsal tubercle; no tarsal fold. Tibio-tarsal articulation reaching the tip of the snout or beyond; tibia as long as or a little shorter than the fore limb. Skin nearly smooth; posterior half of upper eyelids warty; a fold from the eye to the shoulder; a narrow glandular dorso-lateral fold, beginning behind the upper eyelid, above the supratemporal fold."

*Color*.—"Brown or greyish brown above; sides of snout below the canthi blackish or dark grey, with some more or less distinct dark vertical bars on the lip; supratemporal and dorso-lateral folds edged with dark brown or black on the outer side; a dark crossbar between the eyes and a dark  $\wedge$ -shaped interscapular marking usually present; limbs with regular dark cross-bands; lower parts whitish, uniform, or throat and breast spotted with brown. Male with internal vocal sacs.

"From snout to vent 43 millim." (*Boulenger*.)

*Remarks*.—The types are from Palawan where they were collected by A. Everett. Later the species was discovered by the same collector on Mount Kinabalu, Borneo, and in Celebes. The types are females and consequently have no vocal sacs. Specimens of males taken in Celebes had vocal sacs. In Celebes the species has been taken at an elevation of 4,000 feet. The species appears to be closely related to *Rana leytenensis* Boettger, but that species lacks the dorsolateral fold present in *R. palavaniensis*. According to Boulenger, it is related also to *R. modesta* Boulenger, *R. doriae* Boulenger, *R. limborgii* Sclater, and *R. hascheana* Stoliczka.

#### RANA MAGNA Stejneger

##### PLATE 2, FIG. 2

*Rana magna* STEJNEGER, *Smithson. Misc. Coll.* 52 (1908-10) 437.

*Description of species*.—(From No. 28, Bureau of Science collection; collected on Polillo Island, October, 1909, by C. Canonizado.) Vomerine teeth in two large, oblique, strongly

denticulated series, arising from the anterior inner edge of the choanæ, but their greater length lies behind the posterior edge; separated from each other by a distance less than one-half the length of a single series; two strongly raised, transverse, bony ridges behind choanæ, separated from each other by a distance equal to two-thirds that between choanæ; vomerine teeth barely extend to their anterior level; the latter distance equal to distance of nostril to eye; tongue very large, cordiform; Eustachian tubes as far from each other as from choanæ; two large mandibular "teeth" on the anterior part of lower jaw, fitting into the depressions in upper jaw; head very slightly longer than broad, occipital region rather rugose; snout smooth and flat, except in front of nostrils, which slope very slightly to tip; end of snout high, vertical; canthus very strongly defined, angular to tip; upper part of loreal region vertical, lower part sloping broadly, making the region behind nostril distinctly concave; eye moderate, its diameter reaching a little beyond nostril; nostril about one-fourth nearer tip of snout than eye; tympanum small, its outer edge moderately distinct, about one-half the diameter of eye, separated from eye by a distance one and one-fourth times its diameter; interorbital distance a little greater than width of upper eyelid; skin above rough, tuberculated; a very strong fold from eye to above arm, above tympanum; a short, distinct, glandular fold behind angle of mouth, an elongate fold behind eye curving inward; two strong tubercles on occipital region; two large tubercles on shoulders, behind which are three large tubercles on each side of back; skin of posterior part of body finely granulate, interspersed with numerous larger tubercles; posterior part of eyelid strongly tubercular; indications of a fold between posterior parts of interorbital region; sides strongly tubercular; loreal region tubercular; skin below smooth or finely granulate, wrinkled in posterior part of belly, smooth on posterior part of limbs; first finger longer than second but slightly shorter than fourth, second and third fingers with distinct skin folds on inner side and dim ones on outer side; subarticular tubercles large, round, blunt; tips of fingers swollen into small rounded pads; a prominent tubercle at base of first finger; toes webbed fully, the membrane reaching tip of pad on outer side of first, second, and third toes, and to base of terminal pads elsewhere; pads on toes a little larger than those on fingers; a cutaneous flap on outer part of first toe extending to inner metatarsal tubercle, another on fifth toe interrupted near the middle; inner metatarsal tubercle strong, oval, about half the length of first

toe; no outer tubercle; no dorsolateral fold; tibiotarsal articulation reaches nostril or a little beyond; a rather indistinct tarsal fold; distance between nostrils a little less than their distance from eye, greater than their distance from mouth, and slightly less than width of upper eyelid.

*Color in alcohol.*—Above brown of varying darker and lighter shades; snout somewhat lighter, with an indistinct darker band between eyes; region below and behind eye lighter than loreal region; lower lip spotted and mottled with black; limbs with darker markings, not forming bars; posterior part of limbs dark, reticulated with yellowish brown; below dusky, variously mottled and reticulated with darker; heels and soles of feet dark brown.

*Measurements of Rana magna Stejneger.*

|                                   | mm.  |
|-----------------------------------|------|
| Length, snout to vent             | 130  |
| Length of head, from angle of jaw | 58   |
| Width of head, at tympanum        | 53   |
| Length of snout                   | 22   |
| Diameter of eye                   | 14   |
| Eye to nostril                    | 13   |
| Distance between nostrils         | 10   |
| Tympanum                          | 7    |
| Eye to tympanum                   | 9.1  |
| Upper eyelid                      | 11   |
| Interorbital distance             | 13   |
| Foreleg                           | 67.5 |
| Longest finger, from base of palm | 33   |
| Hind leg                          | 164  |
| Femur                             | 70   |
| Tibia                             | 60   |
| Foot                              | 89   |
| Longest toe                       | 64   |

*Variation.*—The collection of the Bureau of Science contains specimens of this species; my own collection also contains specimens from various localities. The young, like the young of *Rana macrodon*, differ rather markedly from the adult. In *R. magna* the upper eyelid is broader than the interorbital distance; the tympanum is distinct and not as far from the eye; the tubercles and folds on body are less numerous; there is a rather distinct broken dorsolateral fold from eye to above groin (rarely continuous), and there are other shorter longitudinal folds on the sides; the webs on the feet are somewhat excised between the toes; the disks on the fingers are slightly more distinct; the tibiotarsal articulation reaches variously from eye to tip of snout; the dorsolateral fold is separated from the supratympanic fold. The body above is dark brown of varying shades, sometimes with darker

spots; groin strongly marked with black; the youngest specimens usually have a strong, dark brown temporal spot; labials with large brown spots which are continuous on both upper and lower jaws; posterior part of limbs dark, mottled with yellow and white; usually a loreal stripe present.

In the adult specimens the length of the first and fourth fingers varies somewhat. Occasionally the first is longer than the fourth, frequently shorter; the toes are frequently fully webbed, the membrane reaching more than halfway on the toe disks or pads; the large teeth of the females are low, and not prominent as in the males; males invariably have small vocal sacs, the openings being rather small, back and near the angle of the mouth; the arrangement of the vomerine teeth varies considerably, beginning sometimes on the anterior inner edge of the choanæ, sometimes at some distance from them, sometimes in advance of the anterior level, sometimes nearer the hinder level, or they may extend to or behind the transverse palatine ridges.

*Remarks.*—I have no doubt that the specimens are correctly referred to this species. All have small vocal sacs, a character which is not mentioned by Stejneger in his specimens. Boulenger states that *R. modesta* is a smaller species than *R. macrodon*. It is possible that he had not examined the largest specimens. Stejneger compares his specimens with *R. macrodon* only and makes no mention of its relation to *R. modesta* Boulenger.

*Rana magna* is the largest of the Philippine frogs. Specimens are found in the immediate vicinity of water, usually along the banks of small mountain streams or about pools. When disturbed they at once take refuge in the water. Their eggs are deposited in water. Eggs taken from the ovary of a female in the Bureau of Science collection measured 2.5 millimeters in length.

# RANA LEYTENSIS Boettger

## PLATE 2, FIG. 1

*Rana leytensis* BOETTGER, Zool. Anz. 16 (1893) 365; BOULENGER, Proc. Zool. Soc. London (1897) 229.

*Description of species.*—(From No. 1040, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, 1912.) Vomerine teeth in two oblique series, arising from the inner edges of the choanæ, but lying for the most part behind them, separated from each other by a distance about half the length of a single group; two distinct, enlarged, sharp teeth in anterior part of lower jaw; choanæ not large, distance between them equal to

distance of nostril from eye; head longer than wide, the canthus rounded angularly; snout rather rounded; upper part of loreal region nearly vertical, lower part obliquely sloping, leaving the lores concave; nostril one and a half times farther from eye than end of snout; distance between nostrils equals their distance from eye; eye large, more than four-fifths the length of snout; tympanum large, distinct, about one-half the size of eye, separated from eye by a distance about one-half its diameter; interorbital region equal to width of a single eyelid; skin on anterior part of body above smooth, with longitudinal folds of unequal length; an inverted V-shaped fold in middle of back; the most prominent folds are dorsolateral, beginning behind eye, and not continuous with the very distinct supratympanic fold which continues to near insertion of arm; posterior part of body with tubercles, some large, some very small; tibia and foot also minutely tubercular; sides rough, with short longitudinal folds and tubercles; belly, throat, and underside of limbs entirely smooth; posterior aspect of thigh rather granular; a few small glandular folds above arm and at angle of jaw; fingers elongate, rather slender, with distinct, though small, disks without transverse grooves; first and second fingers equal, reaching first subarticular of third; fourth longer than first two; subarticular tubercles prominent; a prominent tubercle at base of first finger, two indistinct ones on palm; inner side of second and third fingers with distinct skin fold; toes elongate, slender, with disks, about two-thirds webbed; membrane reaches base of disk on second and third toes on outer side, but not on inner, and to base of disk on inner side of fifth; on fourth toe the web reaches first outer subarticular tubercle, and continues to disk as two narrow margins; fifth toe reaches second outer tubercle, and third toe reaches first subarticular tubercle of fourth; a distinct, elongate, oval, inner metatarsal tubercle more than one-third the length of first toe; no outer tubercle; a skin flap on outer side of fifth toe; a very slight skin fold continues behind inner metatarsal tubercle; tibiotarsal articulation reaches to near nostril. Males with internal vocal sacs, the slitlike opening conspicuous on either side and somewhat behind tongue.

*Color in life.*—Above dark olive brown with a blackish stripe across head over eyelids; folds and tubercles usually slightly darker in color; sides brownish, with a black tympanic spot and a few scattered darker spots on sides; loreal region dark; limbs indistinctly barred with darker; posterior part of limbs dark, mottled with yellowish; belly cream, with dusky markings on throat and under thighs; palms and soles slate color.

*Measurements of Rana leytenensis Boettger.*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 48   |
| Width of head         | 17   |
| Length of head        | 18.5 |
| Length of snout       | 8    |
| Diameter of eye       | 6.8  |
| Diameter of tympanum  | 3.5  |
| Foreleg               | 29.5 |
| Longest finger        | 12.5 |
| Hind leg, from vent   | 74.5 |
| Femur                 | 21   |
| Tibia                 | 21.5 |
| Foot                  | 34.5 |
| Longest toe           | 22.5 |
| Toe disk              | 1.2  |

*Variation.*—In the collections studied there are four groups of specimens: from Polillo; from southern Sulu Archipelago; from Zamboanga, Mindanao; and from Bunawan, Agusan. These may be separated easily, as they all differ from each other more or less.

The Polillo specimens (in alcohol) are lighter brown above, showing two yellowish brown stripes from eye to end of body. The stripes on the legs are distinct, but the temporal spot is sometimes dim or wanting; behind the V-shaped mark the large granules, or tubercles, are arranged roughly in two parallel rows, which continue backward to end of body. The skin folds on inner fingers are distinct; the enlarged teeth are prominent in males and females; eggs in the belly of females measure 2 millimeters in length. The large teeth in the lower jaw are dim or wanting in individuals of the size of Boettger's type specimens, 28 millimeters.\*

The Mindanao specimens resemble the Polillo forms; many of them, however, have the anterior part of the head yellowish brown in front of the transverse blackish line, and many have the belly spotted brown. The webbing of the feet and the proportionate length of the digits are exactly the same as in the Polillo specimens.

The specimens from the islands about the southern end of Tawitawi are very dark, almost slatish black above, the band scarcely distinguishable from the body color; the anterior part of head is lighter; the web between toes reaches to second tubercle of fourth toe, leaving three joints free; the membranes fail to reach

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\* Boettger does not mention this character in his description, nor does Boulenger in his notes.

disks, save as very narrow skin folds; the skin fold on fifth toe is slightly narrower; the first finger is longer than second by half the length of disk, and the skin fold on inner fingers is less distinct; the inverted V-shaped fold is present, but the double row of pustules behind is wanting.

*Remarks.*—The type was collected by José Quadras and the locality given is "Island of Leyte." The species is known also from Polillo, Mindanao, Tawitawi, Bongao, and Papahag, in the Philippines. Boulenger reports the species from several localities in Celebes, and from Sandakan, North Borneo.

Specimens are found invariably in the immediate neighborhood of water, usually along streams. I have not been able to recognize their tadpoles.

**RANA ERYTHRÆA (Schlegel)**

PLATE 1, FIG. 2

*Hyla erythræa* SCHLEGEL, Abbild. Amphib. (1837) 27, pl. 4, fig. 3.  
*Limnodytes erythræus* DUMÉNIL and BIBRON, Erp. Gén. 8 (1841) 511; CANTOR, Cat. Mal. Rept. (1847) 141; Journ. As. Soc. Bengal 16 (1847) 1062.

*Hylarana erythræa* TSCHUDI, Class. Batr. (1838) 78.

*Hylorana erythræa* GÜNTHER, Rept. Brit. India (1864) 425; STOLICZKA, Proc. As. Soc. Bengal (1872) 104; ANDERSON, Zool. Yunnan 846; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 65; FISCHER, Jahrb. Wiss. Anst. Hamburg 2 (1885) 80.

*Hylorana subcærulea* COPE, Proc. Acad. Nat. Sci. Philadelphia (1868).

*Rana erythræa* BOULENGER, Proc. Zool. Soc. London (1897) 231; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 67.

*Description of species.*—(From No. 858, E. H. Taylor collection; collected at Hinigaran, Negros, P. I., October, 1915, by E. H. Taylor.) Vomerine teeth in two transverse, oblique, converging series, arising near the anterior inner edge of choanæ,

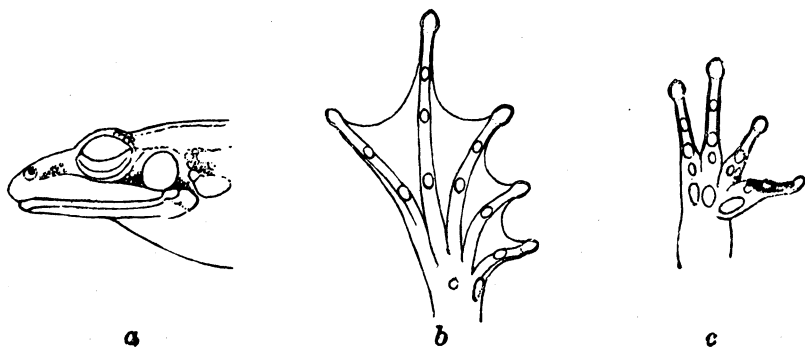


FIG. 1. *Rana erythræa* (Schlegel); a, side of head; b, foot; c, hand;  $\times 1$ .

and extending somewhat behind their hinder level, separated from each other by a distance equal to the length of a single group; choanæ small, partly hidden under edge of jaw; tongue notched deeply behind, forming two rather long horns; head elongate, nearly one-fourth longer than wide; snout rather pointed, one and one-half times diameter of eye; nostril nearer end of snout than eye; tympanum large, distinct, rounded, its diameter about four-fifths that of eye, separated from eye by a distance slightly more than half its diameter; interorbital region equal to the width of an upper eyelid; distance between nostrils equals their distance from eyes; skin above on back granular, on head smooth, no granules on upper eyelids; snout high, projecting over lower jaw; canthus rostralis rounded; loreal region nearly vertical, a deep groove behind nostril on lores; a broad dorsolateral glandular fold from eye to end of body; upper lip thickened, appearing like a glandular fold, continuing somewhat beyond angle of mouth; another elongate glandular fold above arm, continuing brokenly along side; sides strongly granular; chin, throat, and belly perfectly smooth; posterior aspect of thighs strongly granular; tibia with very narrow, dim, longitudinal folds above; first finger extending farther than second and slightly shorter than fourth; fingers provided with small, longitudinally oval pads, much larger than subarticular tubercles, which are distinct; disks with grooves around edges; no skin fold on forearm or outer finger; toes about three-fourths to four-fifths webbed, the web reaching disks on outer sides of toes except fourth and touching disk also on inner side of fifth; web reaches last subarticular tubercle on fourth toe; no skin fold on outer side of fifth toe or on tarsus; a small inner metatarsal tubercle, no outer tubercle; disks on toes slightly smaller than on fingers; tibiotarsal articulation reaches to between eye and nostril.

*Color in life.*—Above bright olive to yellow-green, with two golden to cream yellow stripes covering the dorsolateral glandular folds; a slight, dark brown line borders the yellow stripe on its inner side, and a wider, more distinct blackish stripe below it from eye to end of body; a dark loreal streak and a dark area in front of tympanum; latter golden brown; upper lip creamy yellow, the stripe continuing to the ground color; below cream, with a wash of canary, posterior aspect of thighs brownish, mottled and spotted with darker; no bars on limbs; dark color arranged in longitudinal lines on femur and tibia; web between toes yellowish, dusky spotted.

*Measurements of Rana erythræa (Schlegel), Nos. 858 and 860.*

|                                  | mm.  | mm.  |
|----------------------------------|------|------|
| Length, snout to vent            | 62   | 64   |
| Length of head                   | 24   | 25   |
| Width of head                    | 19.8 | 20.8 |
| Diameter of eye                  | 6.2  | 7.5  |
| Length of snout                  | 10.2 | 10.8 |
| Diameter of tympanum             | 5.3  | 6    |
| Depth of snout, in front of eyes | 6.8  | 7    |
| Foreleg                          | 40   | 42.5 |
| Longest finger                   | 18   | 21   |
| Hind leg                         | 107  | 122  |
| Femur                            | 31   | 35   |
| Tibia                            | 33   | 38   |
| Longest toe                      | 31   | 39   |

*Variation.*—No great amount of variation is observable. In certain specimens the eyelid is slightly wider than the inter-orbital region; in other specimens the belly and the underside of the limbs are distinctly marked with dusky spots. The longitudinal arrangement of the brown color on the legs is apparently invariable.

*Remarks.*—This frog, which I failed to find in Mindanao, was incredibly numerous in central Negros. In the rice fields, where they spawn, the young appear in countless numbers during the latter part of the rainy season. When the dry season begins they collect around pools. My collector brought in more than a hundred specimens taken from a shallow disused well near Hinigaran, Occidental Negros. Only a few of these were preserved.

The species is known in the Philippines from Negros and, according to Fischer, from southern Mindanao. It is widely distributed and is known from Celebes and Borneo, through Sumatra and Java, to the mainland of southeastern Asia. The distribution in the Philippines would appear to be localized. It has not been discovered in Palawan, and careful search has failed to reveal it in Sulu.

## RANA MEARNSI Stejneger

## PLATE 4, FIG. 4

*Rana mearnsi* STEJNEGER, Proc. U. S. Nat. Mus. 28 (1905) 343.

*Description of species.*—(From No. 855, E. H. Taylor collection; collected on Canlaon Volcano, Negros, at an elevation of about 900 meters, December 24, 1915, by E. H. Taylor.) Vomerine teeth in two short, somewhat oblique, well-defined series, beginning anterior to posterior level of choanæ, and separated from each other by less than one-third the length of a

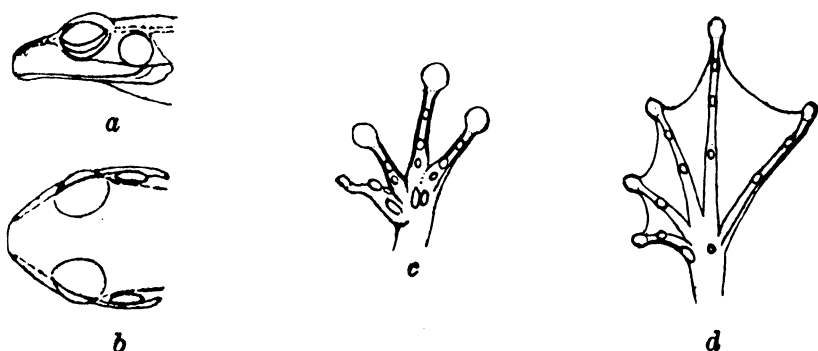


FIG. 2. *Rana mearnsi* Stejneger; a, side of head; b, top of head; c, hand; d, foot;  $\times 1$ .

single group, and from the choanæ by a distance equal to nearly the length of a single group; choanæ large; tongue elongate, deeply notched behind; head low, flat, practically same depth at tympanum as at nostril; canthus rostralis distinct, angular; upper part of lores vertical, lower part sloping obliquely; a slight depression behind nostril; eye large, its diameter reaching slightly beyond nostril; distance of nostril from end of snout contained in distance from eye to nostril about four times; eyes prominent, interorbital distance equal to the width of an upper eyelid; tympanum large, nearly three-fourths diameter of eye, separated from eye by a distance equal to half its diameter; head much longer than wide; skin of body smooth above, on limbs and sides; below, chin and anterior part of belly smooth; posterior part and under thighs strongly granular; a distinct dorsolateral fold from eye, rather narrow; a very slight fold behind tympanum, continuous with the dorsolateral fold; upper eyelids without granules; limbs slender; fingers slender, with greatly widened disks, the disks with grooves around edges, disk of first finger not larger than subarticular tubercles; first finger shorter than second, the disk reaching a little beyond base of disk of second, latter shorter than fourth, which reaches some distance beyond outer subarticular tubercle of third; toes slender, almost fully webbed, the membranes reaching base of disks, except on fourth toe; here the membrane reaches first subarticular tubercle and then continues as a very narrow margin to disk; subarticular tubercles well developed; disks of toes larger than disk of first finger, that of fifth toe smallest; prominent inner metatarsal tubercle present, a very small outer tubercle; a very slight fold along fifth toe and along tarsus; no free flap on outer edge of fifth toe; tibiotarsal articulation reaches a considerable distance beyond tip of snout.

*Color in life.*—Above uniform reddish to lavender brown; sides, loreal region, and about tympanum, lavender; a whitish streak from tip of snout to groin; throat dusky; belly yellowish cream; a few lavender spots under thigh; limbs very dimly barred with darker; small white spots on digits at base of disks.

*Measurements of Rana mearnsi Stejneger.*

|                                 | mm.  |
|---------------------------------|------|
| Total length, snout to vent     | 58   |
| Length of head                  | 22   |
| Width of head                   | 18.4 |
| Length of snout                 | 9    |
| Eye to nostril                  | 6.5  |
| Diameter of eye                 | 7.7  |
| Diameter of tympanum            | 4.3  |
| Depth of snout, in front of eye | 6    |
| Foreleg                         | 40   |
| Longest finger                  | 20.2 |
| Finger disk                     | 4    |
| Hind leg                        | 111  |
| Tibia                           | 34   |
| Femur                           | 30   |
| Longest toe                     | 31.5 |
| Toe disk                        | 2.5  |
| Foot and heel                   | 45   |

The description here given differs from the type description as follows: Vomerine teeth only partially behind choanæ; interorbital distance equal to upper eyelid; tympanum more than one-half, but less than three-fifths, diameter of eye; distance of eye from nostrils a little less than diameter of eye; disks on fingers not pointed anteriorly; no pustules on eyelids or above tympanum; color obviously different.

Three specimens in my collection from Bunawan also differ from the type in a few characters: Tympanum about five-sixths the diameter of eye; interorbital distance greater than upper eyelid; disks of fingers appearing pointed and somewhat smaller than in the Negros form. The last character may be due to the preserving fluid, as the specimens are somewhat hardened. They differ markedly from the type in coloration; two are dark brown above, whitish below, and the third is brownish gray; only one specimen shows two white areas below the anus; the V-shaped mark is evident in two specimens, the dorsolateral streak is wanting in all. The snout in all the specimens is not so truncate as in the Negros form. A specimen in my collection from Baguio,

in a rather poor state of preservation, apparently belongs to this species; the snout is even more truncate than in the Negros specimen; the body is grayish above, and the posterior part of the legs is uniform brownish; the vomerine teeth are in two very small, almost transverse, groups, lying largely in front of the posterior border of the choanæ.

In the proportions of the legs, the webbing of the toes, and the general contour these specimens are almost identical. I believe we have to do with only a variable form and not with different species; the Bunawan specimens are from a place less than 80 kilometers from the type locality.

*Remarks.*—The specimens were all found along small mountain streams, usually under small plants growing on the rocks. They are not uncommon at Bunawan, but are difficult to capture. Many other specimens taken were lost before they could be studied. The type was collected on Baganga River, Davao, Mindanao, by E. A. Mearns.

RANA LUZONENSIS Boulenger

*Rana luzonensis* BOULENGER, Ann. & Mag. Nat. Hist. VI 17 (1896), 401.

*Description of species.*—"Vomerine teeth in two oblique groups between, and extending beyond, the posterior borders of the choanæ. Snout much depressed, acutely pointed, projecting, longer than the diameter of the orbit; canthus rostralis strong; loreal region feebly oblique, grooved; nostril nearer the end of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum very distinct, two-thirds to three-fourths the diameter of the eye. Fingers long and slender, first a little shorter than second, dilated into large disks. Toes webbed to the disks of the third and fifth, to the penultimate phalanx of the fourth; disks smaller than those of the fingers; subarticular tubercles strong; a small oval inner metatarsal tubercle. The tibio-tarsal articulation reaches far beyond the tip of the snout. Skin smooth; a feeble narrow dorso-lateral glandular fold."

*Color.*—"Greyish or olive above, with or without a light vertebral line; a blackish canthal streak and temporal spot; tympanum reddish brown; upper lip with a light, dark edged streak; limbs with dark cross-bands; whitish beneath, throat and breast sometimes brown.

"From snout to vent 58 millim." (*Boulenger.*)

*Remarks.*—This little-known species was discovered in the highlands of Lepanto, Luzon, by John Whitehead. Four specimens were taken, female and half grown. It has not been rediscovered.

**RANA GUERREROI** Taylor

*Rana guerreroi* TAYLOR, Philip. Journ. Sci. 16 (1920) 255.

*Type.*—No. 881, E. H. Taylor collection; collected at Baguio, Mountain Province, Luzon, June 1, 1915, by E. H. Taylor.

*Description of type.*—(Young.) Vomerine teeth in two small, rounded, transverse groups between posterior parts of choanæ, separated from choanæ by a distance twice as great as their distance from each other; distance between choanæ about equal to distance between nostrils; head much longer than broad; snout sloping from eye to tip in lateral profile, rather pointed anteriorly; nostril very much nearer tip of snout than eye; eye large, its diameter equal to nearly four-fifths the length of snout; lores slightly concave, nearly vertical; tympanum small, fairly distinct, about one-third of eye, not as large as finger disks, separated from eye by a distance equal to two-thirds its diameter; distance between nostrils greater than interorbital space; interorbital space one and one-half times upper eyelid; skin on body and limbs above and below smooth; anal region and posterior part of thigh partly granular; a very indistinct trace of dorsolateral skin fold, and another very dim fold above tympanum, not conjoined; fingers slender, the three outer with large, well-developed disks, first finger shorter than second, with a very narrow disk, fourth much longer than second, reaching base of disk on third; disks truncate or slightly rounded anteriorly, with distinct grooves around their edges; subarticular tubercles well developed, carpal tubercles dim; toes almost fully webbed, the membrane reaching outer base of disks on first, second, and third, and inner edge of fifth, and to near outer subarticular tubercle of fourth; third and fifth toes equal, reaching outer subarticular tubercle on fourth; rather large inner metatarsal tubercle and a small outer tubercle; hind leg brought forward, the tibiotarsal articulation reaches much beyond tip of snout.

*Color in life.*—Dark blackish brown above, lighter on sides, with indications of a dim dorsolateral lighter stripe; arms and legs light yellowish drab, barred with numerous darker stripes; belly yellowish white, flecked with dusky; posterior part of thighs and groin yellowish cream.

The species is named for Dr. L. M. Guerrero, of the Bureau of Science, Manila.

*Measurements of Rana guerreroi Taylor.*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 27   |
| Length of head        | 11   |
| Width of head         | 9    |
| Diameter of eye       | 4    |
| Diameter of tympanum  | 1.4  |
| Length of snout       | 5    |
| Foreleg               | 17.8 |
| Longest finger        | 8.2  |
| Hind leg              | 46.5 |
| Femur                 | 73   |
| Tibia                 | 16   |
| Foot                  | 20   |
| Longest toe           | 12   |
| Finger disk           | 1.5  |
| Toe disk              | 1    |

*Variation.*—The nineteen specimens in my collection are all young, most of them having just completed their transformation; several still have tail buds, and one specimen, poorly preserved, is a tadpole. They vary from dark to light above, some showing rather distinct dorsolateral glandular folds and a fold above the tympanum; the limbs are lighter than the rest of body and are barred more or less distinctly.

*Remarks.*—I have endeavored to refer this group of specimens to some known species, but have failed to do so to my satisfaction. The characters recorded will serve to identify the adult.

The species differs from *Rana luzonensis* Boulenger in having a very much smaller tympanum, and in the presence of an outer metatarsal tubercle and a supratympanic fold, the latter separate from the dorsolateral glandular fold.

The specimens were taken along small streams near Baguio, usually under rocks or bits of wood, though frequently at some distance from water.

**RANA SANCHEZI Taylor**

*Rana sanchezi* TAYLOR, Philip. Journ. Sci. 16 (1920) 256.

*Type.*—No. F38, Bureau of Science collection; collected in the extreme northern part of Palawan, P. I., April, 1918, by E. H. Taylor.

*Description of type.*—Vomerine teeth in two slender oblique series, arising between the choanæ at a distance from their inner edge equal to about one-third the length of one group; they fail to reach farther forward than the middle of the choanæ, and their greater part lies behind the posterior border; separated from each other by a distance a little less than the length of one series; distance between Eustachian tubes equals their distance from choanæ; distance between choanæ much greater than

distance between nostrils and equal to distance between eye and nostril; head much longer than wide; diameter of eye equal to its distance from nostril; nostril one-third nearer end of snout than eye; tympanum large, its diameter more than two-thirds eye; distance from eye equal to a little more than one-third its diameter; interorbital distance about equal to width of eyelid; snout slightly depressed between nostrils; canthus rostralis distinct, angular; snout rather rounded in front, sloping downward in front of nostrils; loreal region concave, the upper part nearly vertical; skin above finely granular, the granules less distinct on upper part of limbs and eyelids and wanting on snout; a strong, well-defined dorsolateral glandular skin fold from eye to end of body; fold behind tympanum wanting or very obscure; a distinct white glandular fold behind angle of mouth to above arm, broken medially; sides finely granular; throat, chin, and belly entirely smooth; posterior part of thigh granular; also granular about anal region; first and second fingers equal, both distinctly shorter than fourth; fingers with well-defined disks, the largest disk not more than one-half tympanum; disks on first and second fingers equal, smaller than those on third and fourth; subarticular tubercles large, rounded; an elongate tubercle at base of first finger; very slight skin folds on inner sides of second and third fingers; toes about three-fourths webbed, the membrane reaching to base of disk on outer side of second and third, inner side of fifth, and midway between first and second subarticular tubercles of fourth; third toe extends as far as fifth, both reaching halfway between first and second tubercles of fourth; disks on toes a little smaller than those on fingers and slightly more pointed; a very small inner metatarsal tubercle, not more than one-sixth the length of first toe; a small, dim outer tubercle; tibiotarsal articulation reaches tip of snout; no skin, but a very indistinct skin fold along fifth toe and metatarsal; disks of toes and fingers with strong grooves around edges. Males with vocal sacs.

*Color in life.*—Above bronzy to olive brown with very small, indistinct darker flecks and marblings; canthus rostralis and dorsolateral fold silver-gray, a dark loreal stripe continuing to behind tympanum; tympanum lighter brown; lip rather glandular, with a greenish to yellowish white, narrow, regular stripe continuing to insertion of arm; upper part of sides similar to back; belly silvery white; lower lip rather dark, with a dim spot at base of arm; limbs same as back, with very indistinct barring; black spots on disks of outer fingers; posterior part of thigh reticulated with yellowish.

*Measurements of Rana sanchezi Taylor.*

|                              | mm.  |
|------------------------------|------|
| Length, snout to vent        | 49   |
| Length of head               | 19   |
| Width of head                | 14   |
| Length of snout              | 9.2  |
| Eye to nostril               | 5.5  |
| Diameter of eye              | 6.5  |
| Diameter of tympanum         | 4.4  |
| Interorbital distance        | 4.1  |
| Foreleg                      | 32   |
| Longest finger               | 14.2 |
| Finger disk, largest         | 2    |
| Hind leg                     | 82   |
| Femur                        | 21   |
| Tibia                        | 26   |
| Foot                         | 36.5 |
| Longest toe, with metatarsal | 24   |
| Toe disk, largest            | 1.9  |

*Variation.*—A specimen was taken on Lubang Island, north of Mindoro; one on Busuanga, Calamianes; and several in northern Palawan. The Lubang specimen is a young female. In color markings, both above and below, the specimen is practically the same as the type save for the following variations: The Lubang specimen has a slightly lighter line following the dorsolateral glandular fold which continues on canthus rostralis; disks on first and second fingers about equal, very much smaller (nearly half) than those on third and fourth fingers; membranes between fingers more deeply excised, reaching disks by a rather narrow margin; the broken white glandular fold from mouth to above arm prominent; no traces of bars on legs. The Busuanga specimen (31 millimeters) is slightly larger than the Lubang specimen; its sides are darker than in the type and its back is a little lighter and marbled indistinctly with darker; the fifth toe extends very slightly farther than third; no trace of bars on hind or front legs. In one of the Palawan specimens the first toe extends very nearly as far as the second; two specimens are lavender, with darker markings, and the bars on the legs are extremely dim or wanting.

*Remarks.*—Specimens were taken along streams in low mountains. For the most part they were found perched on leaves of vines or plants, or on the bark of trees near the water, in which they immediately took refuge. *Rana sanguinea* was found in similar places.

The species is closely related to *Rana sanguinea*, and young specimens are very much alike in habitus. They are clearly differentiated by color and markings, the strongly defined,

definitely limited temporal spot being very characteristic of *R. sanguinea* Boettger, as is also the long first finger, which extends considerably beyond the second and fourth fingers. In like manner this species also differs from *R. varians* Boulenger, which I regard as identical with *R. sanguinea*. The toe and finger pads of this new species are more truncate than in *R. sanguinea*, and numerous other differences are evident on a comparison of specimens or of descriptions.

From *Rana everetti*, *R. sanchezi* differs in having smaller disks on digits (disks on toes and fingers are nearly same size) their diameter less than one-half of tympanum; the toes are not fully webbed, and there is present a distinct dorsolateral glandular fold, but no separate temporal fold above tympanum. From *R. luzonensis* it differs in having shorter limbs, the skin granular above, and in the presence of an outer metatarsal tubercle. It appears to be related to *R. labialis* Boulenger, although that species is said to be allied to *R. chalconota*. From *Rana labialis* it differs in having the first and second fingers equal, and the disks of the toes practically of the same diameter as those of the fingers; the lateral glandular folds are distinct to the end of the body. Unfortunately, I have no specimens of *R. labialis* for comparison.

The species is named for Father F. Sanchez, S. J., of Ateneo de Manila.

#### RANA SANGUINEA Boettger

##### PLATE 5, FIG. 2

*Rana sanguinea* BOETTGER, Zool. Anz. 16 (1893) 364.

*Rana varians* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 86;  
Proc. Zool. Soc. London (1897) 231; BARBOUR, Mem. Mus. Comp.  
Zool. Harvard Coll. 44 (1912) pl. 5, fig. 12.

*Description of species.*—(From No. F60, Bureau of Science collection; collected in the extreme northern end of Palawan, P. I., May 10, 1918, by E. H. Taylor.) Vomerine teeth in two oblique transverse series, somewhat separated from choanæ and extending behind the posterior edge, separated from each other by a distance less than half the length of a single series; tongue rather pear-shaped, with two rounded horns behind; head rather depressed, slightly concave on forehead, nearly one-third longer than broad; canthus rostralis angular, distinct, the snout rather obtusely pointed; loreal region nearly vertical, only slightly concave; distance from nostril to tip of snout contained slightly more than twice in distance from nostril to eye; interorbital region slightly concave, about as wide as an eyelid; tympanum large, very distinct, separated from eye by a distance less than

one-half the diameter of tympanum; latter little more than three-fourths the diameter of eye; a slight, distinct dorsolateral skin fold from eye along sides to end of body; another very dim fold from eye to insertion of forearm above tympanum continuous anteriorly with the lateral folds; fingers unwebbed, with small, longitudinally oval disks, about the size of, or a little larger than, the subarticular tubercles; three large, distinct tubercles on palm; first finger much longer than second, which is shorter than fourth; toes about four-fifths webbed, webs not reaching base of disks, save on outer side of first three toes; on fourth toe web reaches a little above last subarticular tubercle; toes with well-developed disks, larger than disks on fingers; well-developed inner and outer metatarsal tubercles, inner oval, outer rounded; no skin flap on outer toe; no fold on tarsus or heel; tibiotarsal articulation reaches beyond tip of snout by a distance equal to that from eye to end of snout; skin almost smooth above, with no granulations apparent; skin on chin, sides, and belly smooth; a granular area on ventral aspect of thighs and on eyelids; skin on upper part of tibia granular.

*Color in life.*—Above pinkish brown, with dim darker reticulations; loreal region from point of snout to eye dark blackish brown; a large, dark black-brown spot behind eye, limited by the dim skin fold from eye to arm, entirely covering tympanum but not reaching mouth; a small longitudinal spot on anterior base of arm; posterior side of arm with dark spots and markings; a few scattered small spots on sides; transverse bars on anterior part of foreleg; hind leg with dusky transverse bars, anterior aspect of limb spotted and mottled with dark brown; posterior aspect of thighs yellow, reticulated with brownish; a brown stripe on anterior side of tibia; below creamy, yellow on posterior part of belly; chin rather dusky, lower jaw darker, with cream spots; breast with two rather large distinct spots; entire interdigital membrane dark; heel and under part of foot dark.

*Measurements of Rana sanguinea Boettger.*

|                                 | Female.<br>mm. | Male.<br>mm. |
|---------------------------------|----------------|--------------|
| Length, snout to vent           | 62             | 40           |
| Length of head                  | 24             | 16           |
| Width of head                   | 18             | 12           |
| Diameter of eye                 | 6.5            | 5            |
| Diameter of tympanum            | 5.4            | 3.8          |
| Length of snout                 | 10.5           | 7.5          |
| Height of head, in front of eye | 7              | 4            |
| Foreleg                         | 38             | 27           |
| Hind leg                        | 119            | 82           |
| Tibia                           | 39             | 28           |

*Variation*.—Two small specimens taken in the same locality agree very well with the one described. One of them is reddish brown above, the other grayish brown; the latter lacks the two spots on the breast, and the lip above is rather whitish. Two specimens taken at Concepcion, Busuanga, agree with the latter specimen in having a stripe on the upper part of the lores and the lip rather lighter. In these specimens the fold from the eye to the arm is very dim or wanting.

*Remarks*.—Boettger described his *Rana sanguinea* in 1893, and Boulenger his *R. varians* in 1894. Both species are recorded as being related to *R. temporalis* Günther. A comparison of descriptions reveals no essential differences. I am convinced that the two species are identical, and that the type of *R. sanguinea* Boettger is an immature specimen of *R. varians* Boulenger. I have no specimens of *R. sanguinea* from the type locality, which is Culion, but have a specimen from a nearby locality, Busuanga, at a point on the island nearest Culion. Boettger \* described a *R. moluccana* from Halmaheira and Ternate, while in a later work † he regarded this species as identical with *R. varians* Boulenger. Barbour ‡ fails to agree with the later conclusion, but retains the species as distinct from *R. varians* Boulenger. Boettger evidently recognizes Boulenger's species as distinct and makes no mention of *R. moluccana* as being related to *R. sanguinea*.

Let us note the differences between the recorded description of the type and the description of the other two species. In *Rana varians* the tympanum is as large or nearly as large as the eye; in *R. sanguinea* it is more than three-fourths of the eye. In *R. varians* the interorbital distance is as broad as the upper eyelid or a little narrower; in *R. sanguinea* it is broader than a single eyelid. *Rana varians* has the toes nearly entirely webbed, the last two phalanges of the fourth toe free; *R. sanguinea* has the toes three-fourths webbed, the last two phalanges of the fourth toe free. In *R. varians* the tibiotarsal articulation reaches the snout or beyond; in *R. sanguinea* it is one and one-half times as long. In *R. varians* the tibia is as long as the foreleg or a little shorter; in *R. sanguinea* it is slightly longer. None of the characteristics are contradictory; the only significant ones are the difference in the length of the hind leg and in the reach of the tibiotarsal articulation. Boettger mentions a small glandular fold below the tympanum behind the mouth

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\* Zool. Anz. 18 (1895) 132.

† Abh. Senck. Nat. Ges. 25 (1900) 366.

‡ Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912).

in *Rana sanguinea* which Boulenger does not mention in his species.

Undoubtedly, the species which I have described is *Rana sanguinea*, but certain variations occur which should be considered. In the largest specimen the small fold behind the mouth is not evident; in nearly all the specimens there appears to be a slight supratemporal fold; the spots on the breast are wanting in two specimens. There is some variation in the reach of the tibio-tarsal articulation. In the younger specimens the dorsolateral folds are dim or wanting.\*

RANA EVERETTI Boulenger

PLATE 6, FIGS. 1, 1a, AND 1b

*Rana everetti* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 72, pl. 6; Proc. Zool. Soc. London (1897) 232.

*Description of species.*—(From type description, Boulenger.) "Vomerine teeth in two small oblique series, commencing on a level with the hinder edge of the choanæ. Head depressed; snout rounded, with distinct canthus rostralis and concave loreal region; interorbital space as broad as the upper eyelid; tympanum three-fourths the width of the eye. Fingers slender, first not extending as far as second; toes moderate, entirely webbed; tips of fingers and toes dilated into disks, those of the former large, measuring about two-thirds the width of the tym-

\* I append the original description of *R. varians* Boulenger, Ann. & Mag. Nat. Hist. VI 14 (1894) 86.

"4. *Rana varians* sp. n.

"Closely allied to *R. temporalis*, Gthr. Vomerine teeth in two oblique series extending beyond the level of the hinder edge of the choanæ. Head depressed, longer than broad; snout obtusely or acutely pointed, prominent, longer than the diameter of the orbit; canthus rostralis angular; loreal region nearly vertical, strongly concave; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid or a little narrower; tympanum very distinct, as large as the eye or a little smaller. Fingers moderate, first extending beyond second; toes nearly entirely webbed; tips of fingers and toes dilated into well-developed disks; subarticular tubercles well developed; inner metatarsal tubercle oval, blunt; a small round outer metatarsal tubercle; no tarsal fold. Tibio-tarsal articulation reaching beyond the tip of the snout; tibia as long as the fore limb. Skin finely granulate, with or without scattered small warts; a narrow glandular dorso-lateral fold. Brown, pink, or dark grey above; a black streak below the canthus rostralis and a black temporal blotch; limbs with dark cross bands; hinder side of thighs marbled with brown; some specimens with a pale line along the vertebral line and another along the upper surface of the tibia. Male with internal vocal sacs and without humeral gland.

"From snout to vent, ♂ 43 millim., ♀ 70."

panum, those of the latter smaller; subarticular tubercles well developed; a small oval inner, and an indistinct outer metatarsal tubercle. The hind limb being carried forwards along body, reaches the tip of the snout. Skin smooth; a rather indistinct glandular fold above the tympanum; angles of the mouth glandular."

*Color*.—"Light greyish brown above, with round dark spots; limbs indistinctly cross-barred; under surface of hind limbs speckled with greyish brown."

*Remarks*.—Boulenger has given no measurements for this species, but it is presumed that his superb figure reproduced here is life size. It measures 88 millimeters from snout to vent.

The type, a female specimen, is from Zamboanga, and was collected by Everett. The species has since been found by the same collector in Borneo and Celebes. *Rana everetti* may be distinguished from *R. varians* (= *R. sanguinea* Boettger) by the following characters: The first finger is shorter than the second; the finger disks are larger, equal to from one-half to two-thirds the tympanum; the tibiotarsal articulation reaches tip of snout or a little beyond; the males have internal vocal sacs and no humeral gland; a white streak usually borders the upper lip. *Rana everetti* is said to lay its eggs in a frothy mass out of the water.

*Description of tadpoles*.—(From Boulenger.)\* "Length of body once and a half to once and two-thirds its width, about half as long as the tail. Nostrils nearly equally distant from the eyes and the tip of the snout. Eyes on the upper surface, equally distant from the tip of the snout and the spiraculum, the distance between them a little greater than the distance between the nostrils. Spiraculum on the left side, directed upwards and backwards, nearer the posterior extremity of the body than the end of the snout. Anal opening on the right side close to the lower edge of the caudal crest. Tail about thrice and a half as long as deep, acutely pointed; crests lower than the muscular portion, the dorsal not extending on the body. Mouth as broad as the interocular space; series of labial teeth  $\frac{4}{3}$  the outer upper and the three lower continuous, the others restricted to the sides; lower lip bordered by a double series of papillæ; beak broadly edged with black. Dark brown or blackish above, greyish below; upper caudal crest dark brown, lower greyish.

"Total length 45 millim.; body 14; tail 31; depth of tail 8.

"This tadpole is essentially that of a typical *Rana*."

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\* Proc. Zool. Soc. London (1897) 232.

RANA SULUENSIS Taylor

*Rana suluensis* TAYLOR, Philip. Journ. Sci. 16 (1920) 264.

*Type*.—No. 1638, Bureau of Science collection; collected near the southern end of Tawitawi Island, P. I., October, 1918, by E. H. Taylor.

*Description of type*.—(Female.) Vomerine teeth in two short, obliquely placed series between choanæ, separated from the latter by a distance half their length, and from each other by a distance nearly equal to their length; choanæ large, distinct, distance between them greater than distance from eye to nostril; distance between Eustachian tubes equals their distance from nostril; head rather flat, longer than broad, very slightly depressed on middle part of snout; canthus rostralis angular; loreal region nearly vertical, somewhat concave; snout rounded when viewed from above, rather pointed when viewed laterally, projecting; nostril much nearer end of snout than eye; distance between nostrils equals their distance from eye, as well as the interorbital distance and width of upper eyelid; diameter of eye reaches beyond nostril; diameter of tympanum from two-thirds to three-fourths that of eye; tympanum very distinct; skin above smooth or minutely granular; no dorsolateral glandular folds; no supratympanic folds; no fold or a very indistinct one above insertion of forearm; skin on sides with occasional, rather large tubercles; limbs smooth above and below; belly, chin, and throat entirely smooth; anal region strongly granular; limbs slender; first finger very slightly longer than second, both a little shorter than fourth; fingers with small disks, rather pointed in front; subarticular tubercles distinct; three distinct carpal tubercles, the largest at base of first finger; toes slender, long, the disks larger than the finger disks, tips somewhat pointed; toes scarcely more than half webbed; the membrane reaches second subarticular tubercle on fourth toe; fifth longer than third, reaching midway between first and second subarticular tubercles; a small inner metatarsal tubercle equal to about one-fourth the length of first toe, and a distinct outer metatarsal tubercle; subarticular tubercles of toes well developed; a very slight fold from tip of fifth toe to tibia; males with well-developed internal vocal sacs; tibiotarsal articulation reaches nostril.

*Color in life*.—Above grayish brown to reddish brown, variegated dimly with purplish, darker brown, and with numerous small, rounded blackish spots with grayish centers; tip of snout whitish, a dorsolateral silver-gray line from tip of snout to end

of body; sides of head and temporal region dark blackish brown, somewhat lighter on sides of body; sides with darker grayish-centered spots; a white line from tip of snout to above arm; arm with dark purple stripe on posterior side, and a dark stripe on underside near insertion; hind limb lighter brown than back, strongly barred with blackish to purplish brown; underside of foot purplish, the outer tubercle white; belly silvery white; chin slightly dusky; hind legs dusky white, below yellowish white; posterior part of thigh dark, marbled and reticulated with yellowish.

*Measurements of Rana suluensis Taylor.*

|                           | mm.  |
|---------------------------|------|
| Length, snout to vent     | 47.5 |
| Length of head            | 19.5 |
| Width of head             | 13.5 |
| Diameter of eye           | 6.1  |
| Diameter of tympanum      | 4.8  |
| Tympanum, from eye        | 1.25 |
| Eye to nostril            | 5.1  |
| Length of snout           | 7.3  |
| Distance between nostrils | 4.6  |
| Foreleg                   | 30   |
| Longest finger            | 13.5 |
| Hind leg                  | 81   |
| Femur                     | 23.2 |
| Tibia                     | 26   |
| Longest toe               | 24   |
| Largest toe disk          | 1.1  |

*Variation.*—The chief variation noted is the presence of a narrow, glandular, dorsolateral fold on several younger specimens, which is dim or wanting on older specimens.

One specimen from the same island was uniformly light brown above, with a distinct dorsolateral fold, the back strongly granular, the granules of different sizes; upper part of legs strongly granular and with longitudinal folds; younger specimens are darker on throat and belly, usually lighter on back, the dark spots not round.

*Remarks.*—This species is related to *Rana sanchezi*, from Palawan, and *R. labialis*, from Borneo, Java, and Malay Peninsula. It differs from these in the lesser extent of webbing between toes, in color and markings, and in the smaller finger disks, which are smaller than those on toes. Specimens of this species were taken only on Tawitawi and a small island at the extreme south-

ern end, only a few meters from the seacoast, at some distance from fresh water. They were found hopping about the base of a large *balete* tree, on the sides, and about the roots. They would take refuge under leaves and root masses. They appeared common in these two localities, but were not observed elsewhere. Fourteen specimens were preserved.

RANA PHILIPPINENSIS Taylor

*Rana philippinensis* TAYLOR, Philip. Journ. Sci. 16 (1920) 266.

*Type*.—No. 662, E. H. Taylor collection; collected in Mindanao, August 12, 1913, by E. H. Taylor.

*Description of type*.—Vomerine teeth in two oblique rounded groups, separated from choanæ and from each other by an equal distance; tongue large, without papillæ; distance between Eustachian tubes much less than their distance from choanæ; distance between choanæ equal to distance between nostrils; head obtusely pointed in upper and lateral profile, projecting somewhat; loreal region nearly vertical, somewhat concave; interorbital region one and one-fourth times upper eyelid; eye large, diameter of orbit equal to the distance to tip of snout; nostril very much nearer tip of snout than eye; tympanum distinct, a little more than three-fifths eye, separated from eye by a distance equal to less than one-third its diameter; skin on entire body smooth; no granules on posterior part of thigh in anal region; no fold above tympanum; no dorsolateral fold; fingers long, large, with pointed disks, larger than subarticular tubercles, which are distinct and well developed; first finger opposed to rest of hand, longer than second, only minutely shorter than fourth, and reaching last joint on third; disks with a small groove around edge; carpal tubercles elongate, comparatively small; no gland on upper arm; toes with pointed disks, larger than those on fingers, and larger than subarticular tubercles on foot; toes nearly two-thirds webbed, webs not reaching disks; an elongate inner metatarsal tubercle and a small outer tubercle present; tibiotarsal articulation reaching beyond eye.

*Color in life*.—Above on back and head yellow to olive brown, with indistinct darker mottling; a broad distinct dark brown dorsolateral stripe from eye to end of body; sides olive yellow, with darker mottling; eyelids dark; tympanum golden yellowish, tympanic region dark brown; limbs yellowish olive brown, with irregular spots and marblings not forming bars; throat dusky brown, belly lighter.

*Measurements of Rana philippinensis Taylor.*

|                              | mm.  |
|------------------------------|------|
| Length, snout to vent        | 50   |
| Length of head               | 20.5 |
| Width of head                | 16   |
| Diameter of eye              | 8    |
| Length of snout              | 8.1  |
| Tympanum                     | 4.9  |
| Interorbital area            | 6.5  |
| Foreleg                      | 35   |
| Longest finger               | 14.5 |
| Hind leg                     | 86   |
| Femur                        | 22   |
| Tibia                        | 28   |
| Longest toe, with metatarsal | 26   |
| Diameter of toe disk         | 1.4  |

*Remarks.*—Only a single specimen, an adult female with eggs, has been collected. The character of the opposed first finger seems to differentiate it clearly from other Philippine species of *Rana*. The markings and the color are characteristic.

**RANA DUBITA** Taylor

*Rana dubita* TAYLOR, Philip. Journ. Sci. 16 (1920) 267.

*Type.*—No. 1460, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, June, 1913, by E. H. Taylor.

*Description of type.*—Vomerine teeth in two slight series between the choanæ, their hinder edge on a level with the choanæ, separated rather widely by a distance of at least half their length; snout rather obtuse, not sloping strongly in front; canthus rostralis evident, rather angular; loreal region nearly vertical, strongly concave; head about one and one-third times as long as broad; snout moderately long; diameter of eye equal to distance from eye to a little beyond nostril; nostril nearer tip of snout than eye; distance of nostril to point of snout contained in distance from nostril to eye a little more than twice; tympanum round, large, its diameter from two-thirds to three-fourths eye; separated from eye by a distance less than half its diameter; interorbital distance much wider than one upper eyelid; skin smooth on back, sides, and belly; no granulation on limbs; probably a very slight lateral fold; no supratemporal fold apparent; fingers slender with large disks; first finger with very small disk, not wider than digit, less than half the width of second finger disk; second finger much shorter than fourth; latter reaching to near base of disk of third finger; largest disks one-half to two-thirds tympanum, disks with a distinct groove around edges; toes broadly webbed, the membrane reaching disk on outer side of

first, second, and third toes, and on inner side of fifth; it reaches last subarticular tubercle on fourth toe; disks not as large as those on fingers, those on second and third toes largest; tibio-tarsal articulation reaching about halfway between eye and nostril.

*Color in life.*—Dark, rather blackish brown above, darker on head; a white line along upper lip, widening below tympanum and continuing back above front limb; arms lighter brown, barred with darker; subarticular tubercles of fingers whitish, a white spot on fingers above at base of disk; hind legs brown, spotted or mottled indistinctly with darker brown; a few yellowish white markings on posterior aspect of thigh and tibia; below dusky yellowish white with darker spots and marbling; underside of thighs yellowish with a few dark spots; interdigital membrane of toes dusky.

*Measurements of Rana dubita Taylor.*

|                             | mm.  |
|-----------------------------|------|
| Total length, snout to vent | 34.5 |
| Length of head              | 15   |
| Width of head               | 11.2 |
| Length of snout             | 6    |
| Diameter of orbit           | 4.2  |
| Diameter of tympanum        | 3.9  |
| Length of longest finger    | 10   |
| Length of longest toe       | 14.5 |
| Tibia                       | 19.5 |
| Foreleg                     | 22   |
| Hind leg                    | 56   |

*Remarks.*—A single specimen was collected at Bunawan, Agusan. It was found in deep forest about 100 meters from water.

**RANA MELANOMENTA Taylor**

*Rana melanomenta* TAYLOR, Philip. Journ. Sci. 16 (1920) 268.

*Type.*—No. 1661, Bureau of Science collection; collected at Papahag, Sulu, October 5, 1917, by E. H. Taylor.

*Description of type.*—Vomerine teeth in two slender oblique series lying between, but extending a little behind, posterior part of choanæ; separated from choanæ by a distance about as great as a single series, from each other by a distance little more than half the length of one series; distance between Eustachian tubes greater than their distance from choanæ; distance between choanæ equals distance between nostrils; tongue without papilla; males with vocal sacs, the openings large; canthus rostralis distinct, slightly rounded; nostrils nearer end of snout than eye; diameter of eye less than snout, barely reaching beyond nostril;

tympanum distinct, about three-fifths eye, separated from eye by a distance equal to one-half its diameter; interorbital distance equal to, or slightly less than, the width of an upper eyelid; loreal region sloping, concave; snout rounded in upper and lateral profile, projecting somewhat; skin on back, sides, and belly smooth; granular on lower and posterior aspect of thighs; skin on chin over vocal sacs somewhat distended and wrinkled; no fold above tympanum; no dorsolateral fold; a distinct glandular tubercle above insertion of arm; no gland on upper part of arm; fingers with small digital disks no larger than subarticular tubercles, which are distinct; first finger longer than second and but slightly shorter than fourth; first finger with nuptial excrescences; three carpal tubercles, large, well defined; each disk with simple groove around edge; toes from one-half to two-thirds webbed, the webs failing to reach disks except as a very narrow margin; disks on toes about as large as those on fingers, and apparently larger than subarticular tubercles of toes; an oval inner, and a rounded outer, metatarsal tubercle.

*Color in life.*—Above lavender-brown, with a wash of gray; a few very small black spots scattered over upper surface; laterally lavender-brown, with darker markings above arm; sides of head and tympanum black; throat black, belly dusky with white marblings; limbs closely barred with blackish; posterior aspect of thigh with small white dots; a white spot at final joint of digits.

*Measurements of Rana melanomenta Taylor.*

|                                   | mm. |
|-----------------------------------|-----|
| Total length, snout to vent       | 35  |
| Length of head                    | 19  |
| Width of head                     | 13  |
| Diameter of eye                   | 4.6 |
| Length of snout                   | 6.3 |
| Foreleg                           | 26  |
| Longest finger                    | 10  |
| Hind leg                          | 66  |
| Tibia                             | 19  |
| Femur                             | 18  |
| Longest toe, including metatarsal | 18  |

*Variation.*—Four specimens were taken, all agreeing with the type in essential characters; one specimen has the throat black, with numerous white spots. The third and fifth toes of all except the type are practically the same length; in the type, however, the third toe of the right foot is much longer than the fifth.

*Remarks.*—These specimens were all obtained near small pools of stagnant water in the forest on Papahag, near Tawitawi. The

species was observed on other islands, but no specimen was taken. In the character of the digits it appears to be closely related to the group to which *Rana similis*, *R. grandocula*, and *R. glandulosa* belong. It differs in having smaller eyes and a shorter snout and in the absence of a papilla on the tongue and of the arm gland.

RANA MOELLENDORFFI Boettger

PLATE 1, FIG. 4

*Rana moellendorffi* BOETTGER, Zool. Anz. 16 (1893) 363.

*Description of species.*—(From No. 1482, Bureau of Science collection; collected in northern Palawan, May 10, 1918, by E. H. Taylor.) Vomerine teeth in two small, rounded, oblique series, very much nearer to each other than to the choanæ, extending behind posterior level of choanæ; tongue rather oval, small, with the two "horns" at the posterior corners, which are rather widely separated at their bases; no papilla; males with vocal sacs, the internal openings small; head somewhat longer than broad, not concave; snout obtusely pointed; eyes not especially prominent; interorbital area nearly one and a half times upper eyelid; diameter of eye only slightly less than length of snout; canthus rostralis rather rounded; lores nearly vertical, with a distinct longitudinal groove behind nostril; distance from nostril to end of snout less than its distance from eye; tympanum very distinct, little more than half diameter of eye, separated from eye by a distance less than one-third its diameter; skin smooth or finely shagreened above, indistinctly granulate on posterior part of eyelids and on sides; skin smooth below save on ventral surface of thigh; no dorsolateral fold; no fold or only a very indistinct one from eye above tympanum; a distinct gland on upper part of arm; fingers slender, with very slight longitudinal oval pads, scarcely wider than fingers; first finger slightly longer than second, fourth longer than first or second, reaching base of disk of third; toes three-fourths webbed, the webs nowhere reaching base of toe disks, which are as large as finger disks; subarticular tubercles well developed; inner metatarsal tubercle elongate, oval, outer smaller, rounded; hind leg brought forward, tibiotarsal articulation reaches somewhat beyond eye.

*Color in life.*—Above yellowish to bronze-green; the entire back, head, and sides covered with large, usually elongate black spots, which frequently join each other, forming islandlike designs; a black loreal streak, below which is a yellow-green line; below this a short dark stripe on edge of lip; tympanum dark brown; dark spots on breast at insertion of arms; arm spotted

with black above and a broken dark line on posterior side; limbs strongly barred with black; posterior part of hind limb black, with a few yellowish white spots on femur; groin similar; below dirty white, with lighter yellowish spots; membrane between toes dark.

*Measurements of Rana moellendorffi Boettger.*

|                             | mm.  |
|-----------------------------|------|
| Total length, snout to vent | 40   |
| Length of head              | 15   |
| Width of head               | 13.5 |
| Diameter of eye             | 5.2  |
| Diameter of tympanum        | 4    |
| Length of snout             | 6.1  |
| Tibia                       | 20   |
| Femur                       | 19   |
| Foreleg                     | 27   |
| Hind leg                    | 61   |

*Variation.*—Three other specimens, all of which are males, taken in the same locality, agree remarkably well with the described specimen, especially in color; two have the entire head outlined above with greenish yellow and the lower labials spotted with yellow; some of the specimens show the presence of a slight glandular area below, and slightly behind, tympanum.

These agree with the type description in essential details, save that the tibiotarsal articulation of the type reaches the point of the snout, while in the specimens at hand it reaches only a short distance beyond the eye; in these also the head is distinctly longer than wide, while in the type the head is as long as wide. The fact that the types are considerably larger, and probably females, may account for the discrepancy. Either the gland on the upper arm was overlooked by Boettger, or it is absent in the type.

*Remarks.*—The specimens were collected on the extreme northern end of Palawan Island. They were found perched on vines growing on trees at the edge of small streams. No other specimen was seen. The type locality is Culion, which is near Palawan.

**RANA SIMILIS (Günther)**

PLATE 4, FIG. 5

*Polypedates similis* GÜNTHER, Proc. Zool. Soc. London (1873) 171.

*Rana similis* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 72.

*Description of species.*—(From No. F326, E. H. Taylor collection; collected on Mount Maquiling, near Los Baños, Luzon,

April 5, 1916, by E. H. Taylor.) Vomerine teeth in two small, distinct, oblique groups lying between, and for the most part posterior to, the hinder level of choanæ; latter moderately large, distant from vomerine teeth by more than the length of a single group; tongue rather small, with a moderate notch behind; a distinct, rounded, low papilla on tongue; males with vocal sacs, the openings small, rounding; snout short, equal, or nearly equal, in length to diameter of eye, rather rounded anteriorly; head longer than wide; canthus rostralis angular, loreal region concave, nearly vertical; tympanum large, distinct, about two-thirds eye, separated from eye by a distance about half its diameter; distance of nostrils from each other equals their distance from eye; interorbital distance equal to upper eyelid; nostril more than twice as far from eye as from tip of snout; skin above smooth on head and body, minutely pitted; sides smooth; chin and belly smooth; ventral and posterior parts of thighs granular; no dorsolateral skin fold; no supratympanic fold; a small glandular fold at corner of mouth and two smaller ones above insertion of arms; fingers slender, with small, distinct disks, those of third and fourth fingers of equal size, larger than those on first and second; first finger extending slightly farther than second, both shorter than fourth; an enlarged nuptial excrescence on inner side of first finger; an enlarged gland on upper arm; subarticular tubercles distinct, well developed; carpal tubercles large, distinct; toes about two-thirds webbed, membranes not reaching disks except as very narrow fringe on outer side of digits; toes with small disks slightly pointed, nearly as large as largest finger disks; an elongate inner metatarsal tubercle, and a small round outer tubercle; no skin fold on fifth toe; no tarsal fold; hind leg brought forward, tibiotarsal articulation reaches a little beyond eye; when viewed from above, eyes project beyond outline of jaws.

*Color in life.*—Above olive slate, slightly mottled with lighter olive on head; an olive yellow line from tip of snout along canthus rostralis, across edge of upper eyelid, to end of body along the dorsolateral edge; from tip of snout to eye a purplish slate loreal area; behind eye on sides dark purplish slate; tympanum brown; a narrow labial line, beginning in front of eye, continues to angle of mouth, ending in a white spot on the dim granular fold; lower side mottled with greenish yellow; throat dusky; belly dirty white; limbs olive above, with numerous, broad, slate bars, five or six on the tibia, and continuing on the foot; heel and underside of foot dark; underside of hind legs dusky.

*Measurements of Rana similis (Günther). Nos. F326 and F325.*

|                                | mm.  | mm.  |
|--------------------------------|------|------|
| Length, snout to vent          | 46   | 46   |
| Length of head                 | 17   | 16   |
| Length of snout                | 6.5  | 6.6  |
| Width of head                  | 14   | 14.2 |
| Diameter of eye                | 6.5  | 6.2  |
| Diameter of tympanum           | 4.6  | 4.2  |
| Depth of head, in front of eye | 6    | 6    |
| Foreleg                        | 31.5 | 28.2 |
| Longest finger                 | 11   | 11.6 |
| Hind leg                       | 77   | 69.5 |
| Femur                          | 19.5 | 18.5 |
| Tibia                          | 24   | 19.5 |
| Foot                           | 33   | 31   |
| Longest toe                    | 21.5 | 19   |
| Toe disk                       | 1.2  | 1.5  |

*Variation.*—Eight specimens in my collection from Los Baños exhibit but very little variation in color and markings. All appear to be males; at least all have the internal openings to the vocal sacs. Comparison of the measurements in the preceding table with the following measurements of several specimens will show that there is a slight variation in the length of the hind leg.

| Body length. | Hind leg. |
|--------------|-----------|
| mm.          | mm.       |
| 43.5         | 70        |
| 46           | 77.5      |
| 46.5         | 69.5      |
| 41           | 67.5      |
| 44.5         | 69        |
| 44           | 69        |
| 45.2         | 71.5      |

In these specimens the tibiotarsal articulation reaches to the eye and, possibly, slightly beyond.

*Remarks.*—The smooth skin, the shorter legs, the presence of a swelling, or papilla, on the anterior part of the tongue, and the gland on the upper arm seem to distinguish this species from *Rana signata* Günther. *Rana moellendorffi* Boettger, from Palawan and the Calamianes, is very closely related also; the markings, however, of *R. moellendorffi* are strikingly different, the interorbital distance is wider, usually one and a half times the eyelid, and the papilla is absent from the tongue. Other differences are in evidence on a comparison of the specimens.

Specimens in the collections are from Bataan and Laguna Provinces, Luzon; the type is from "Laguna de Bay," Luzon, and was collected by A. B. Meyer. Boulenger is of the opinion that *Rana similis* and *R. signata* are the same species.

RANA GRANDOCULA Taylor

PLATE 7, FIGS. 2 AND 2a

*Rana grandocula* TAYLOR, Philip. Journ. Sci. 16 (1920) 274.

*Type*.—No. F334, E. H. Taylor collection; collected near Bunawan, Agusan, Mindanao, August, 1912, by E. H. Taylor.

*Description of type*.—Vomerine teeth in two small, slightly diagonal, rounded series between choanæ, posteriorly separated from choanæ by a distance much greater than the length of a single series, and from each other by a distance less than half of a single series; distance between openings of Eustachian tubes less than their distance from choanæ; distance between choanæ equals distance between nostrils; head longer than wide, snout protruding slightly; eyes very large and protruding; diameter about one-fourth or one-fifth longer than snout; nostril nearer tip of snout than eye; tympanum quite distinct, its diameter about half of eye, separated from eye by a distance equal to one-third of its diameter; canthus rostralis distinct, roundly angular, the loreal region nearly vertical, the lores concave; width of upper eyelid little more than one and one-third times interorbital distance; skin of body above and below entirely smooth; a few granules on posterior aspect of thigh and about anal region; no dorsolateral fold; no fold above tympanum; digits slender, tips of fingers and toes dilated into small disks with grooves around their edges; first finger extending as far as, or very slightly farther than, second, both but slightly shorter than fourth, which just fails to reach base of disk on third; sub-articular tubercles well developed, as are the carpal tubercles; first finger with nuptial swellings; toes about two-thirds webbed, the membrane failing to reach disks but approaching nearest on second toe; third and fifth toes of nearly equal length; sub-articular tubercles strong; an elongate, inner metatarsal tubercle more than one-third the length of first toe; a rounded, fairly prominent, outer metatarsal tubercle; disks rather pointed at tips; tibiotarsal articulation reaches anterior edge of eye or slightly farther; a distinct oval gland on inner side of upper arm; males with internal vocal sacs, the openings rather far back on either side of tongue.

*Color in life*.—Above olive to chestnut brown, with numerous indistinct darker flecks and spots; sides slightly darker and rather thickly spotted; limbs with spots or bars; dusky brown on throat and chin, lighter on belly; underside of feet and hands rather purplish, the tubercles lighter; a distinct light spot above last joint of digits.

*Measurements of Rana grandocula Taylor, Nos. F334 and F337.*

|                            | mm.  | mm.  |
|----------------------------|------|------|
| Length, snout to vent      | 40   | 44   |
| Length of snout            | 6.2  | 6.1  |
| Diameter of eye            | 7.3  | 7.1  |
| Diameter of tympanum       | 3.8  | 4.2  |
| Interorbital distance      | 3.4  | 3.6  |
| Upper eyelid               | 5.1  | 5    |
| Length of head             | 16.5 | 17   |
| Width of head              | 13   | 14.5 |
| Foreleg                    | 25   | 27   |
| Longest finger, from wrist | 11   | 11   |
| Hind leg                   | 65   | 68.2 |
| Femur                      | 18.2 | 20   |
| Tibia                      | 19.8 | 21.2 |
| Foot                       | 27.5 | 29   |
| Longest toe                | 17   | 19.5 |
| Finger disks               | 1.2  | 1.2  |
| Toe disks                  | 1.1  | 1.3  |

*Variation.*—Several specimens in the collection show but little variation. The ground color varies from darker to lighter than the type. Some of the specimens have a distinct white line on the upper lip. The gland on the arm seems to be present in both sexes.

*Remarks.*—There are several specimens of this species in my collection, all from Agusan River Valley, near Bunawan. It appears to be closely related to *Rana similis* (Günther) but differs from it strikingly in the much larger and more prominent eye, the shorter snout, the smaller tympanum, the absence of a fold at angle of mouth, and the very different markings and coloration. Specimens were taken along Bunawan River in large pools in worn rocks; numerous in this locality.

**RANA GLANDULOSA Boulenger**

· PLATE 5, FIGS. 1, 1a, and 1b

*Rana glandulosa* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 73, pl. 7; Ann. & Mag. Nat. Hist. VI 14 (1894) 87; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 448; FLOWER, Proc. Zool. Soc. London (1896) 905; (1899) 897; LAIDLAW, Proc. Zool. Soc. London (1900) 887.

*Description of species.*—"Vomerine teeth in two short oblique series, between the choanæ. Head rather large; snout rounded, as long as the orbit, with obtuse canthus rostralis and concave loreal region; nostril nearer snout than eye; interorbital space nearly same as upper eyelid; tympanum distinct, three-fifths to three-fourths the diameter of the eye; fingers rather elongate,

first extending much beyond the second; toes moderate, one-half to two-thirds webbed; tips of fingers and toes merely swollen or dilated in small disks; subarticular tubercles prominent; a small oval inner metatarsal tubercle and a small round one at the base of the fourth toe; tibiotarsal articulation reaches the eye or between the eye and the tip of the snout; back more or less distinctly granulate, with large flat granules at least on the sides.

*Color*.—"Olive or reddish brown, spotted and speckled with blackish; lips dark with large whitish spots or bars; limbs with dark crossbars; lower parts whitish or buff, uniform or spotted with brown. Eye fiery red. Male with vocal sacs on each side forming folds and a large oval gland on the inner surface of the arm. Snout to vent, 95 mm. Found in caves in total darkness." (*Boulenger*.)

*Remarks*.—The types were obtained in Sarawak by A. Everett, who later discovered the species in Palawan; I failed to find it in Palawan. Boulenger reports it from Malay Peninsula.

#### Genus STAUROIS Cope

*Ixalus* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 15, part.

*Staurois* COPE, Nat. Hist. Rev. (1865) 117.

*Rana* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 71, part.

*Micrixalus* BOULENGER, Proc. Zool. Soc. London (1888) 205; Fauna Brit. India, Rept. (1890) 464.

Vomerine teeth present or absent; tympanum distinct; fingers free, with disks; toes webbed; otherwise agrees very well with *Rana*.\*

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\* Boulenger, Ann. & Mag. Nat. Hist. IX 1 (1918) 374, has redefined this genus, listing five species: *Staurois larutensis* Boulenger, Borneo and Malay Peninsula; *S. guttatus* Günther, Borneo; *S. natator* Günther, Philippines; *S. nubilus* Mocquard, Palawan; and *S. tuberilinguis* Boulenger, Borneo. He mentions the following generic characters:

Tympanum small; with or without vomerine teeth; disks on fingers large, broader than long, larger than those of toes, with a half disk within the disk on the lower surface; toes fully webbed, the webs involving base of disks; outer metatarsal separated to base.

The recognition of Mocquard's species *Ixalus nubilus* = *Staurois nubilus* by Boulenger in this paper presents an opinion in which I do not concur. My own collection has more than one hundred specimens of *S. natator* from Mindanao, and I have recently been able to examine specimens of what is probably Mocquard's *Ixalus nubilus* from various parts of Palawan and Busuanga. Occasional specimens from both lots show a papilla on the tongue; there appears to be no difference in average measurements; the granules on the Palawan specimens appear a little coarser than on most of the Mindanao specimens.

One species is found in Palawan, Minadanao, and nearby islands. Very probably it does not enter Luzon, the western Visayan Islands, or Mindoro.

STAUROIS NATATOR (Günther)

PLATE 4, FIGS. 2 AND 2a

*Ixalus natator* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 15, pl. 4, fig. C; Proc. Zool. Soc. London (1879) 79.

*Staurois natator* COPE, Nat. Hist. Rev. (1865) 117.

*Rana natatrix* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 71; BOETTGER, Ber. Senck. Nat. Ges. (1886) 121.

*Staurois natator* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 87.

*Ixalus nubilus* MOCQUARD, Nouv. Arch. Mus. 2<sup>3</sup> (1890) 153, pl. 11, fig. 3.

*Description of species.*—(From No. 1601, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August 12, 1912, by E. H. Taylor.) Vomerine teeth wanting; tongue elongate, oval, deeply notched behind; choanæ large; canthus rostralis angular, curving in between eye and nostril; loreal region vertical for some distance, then sloping out, with the lip nearly vertical; snout narrower behind nostrils than directly in front; tip of snout vertical, rounding in outline; eye very large, equal or nearly equal to length of snout; tympanum small, circular, its diameter from one-third to two-fifths eye; separated from eye by a distance less than half its diameter; interorbital region narrow, a little less than width of upper eyelid; distance of nostrils from each other less than their distance from eye; nostril half as far from eye as from end of snout; skin strongly granular above on loreal region, above eyelids, and back of body; upper surface of limbs smooth; chin and breast smooth; belly and sides with larger granules; anal region and part of underside of thighs granular; no distinct supratemporal fold; no tarsal fold; fingers large, with wide, roughly triangular disks, diameter of disk larger than tympanum; first finger shorter than second, second shorter than fourth, fourth not reaching base of disk of third; fingers unwebbed; toes completely webbed, the membranes reaching base of disks; disks on toes more rounding and a little smaller than disks on third and fourth fingers; disks with distinct grooves on edges and with a transverse depression above; fifth toe extending slightly farther than third, fourth longest; a small inner metatarsal tubercle and a still smaller outer tubercle; subarticular tubercles small, not very clearly defined; the tibiotarsal articulation reaches much beyond snout. Male with internal vocal sacs.

*Color in life.*—Above olive to bronzy green, mottled with darker; legs lighter, barred with the ground color of back; lips, chin, belly, and sides light blue-green, which color penetrates body; tongue, inside of mouth, body cavity, and intestines light blue-green; interdigital membrane of toes dusky.

*Measurements of Staurois natator (Günther).*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 58   |
| Length of head        | 18   |
| Width of head         | 14   |
| Length of snout       | 7.6  |
| Diameter of eye       | 7.2  |
| Diameter of tympanum  | 2.2  |
| Foreleg               | 33   |
| Longest finger        | 14.4 |
| Hind leg              | 85   |
| Femur                 | 25   |
| Tibia                 | 28.5 |
| Longest toe           | 21.5 |

*Variation.*—The variations in this species are chiefly in coloration, that given being most nearly typical. Sometimes the color of the back is bronze with yellowish spots or reticulations; sometimes the blue-green skin on sides and belly has a slight wash of yellow; certain specimens are dark greenish brown with cream yellow spots on sides and back; a small specimen in the Bureau of Science collection preserved in alcohol (No. 1669) has all the legs barred with brown and cream, a darker line from tip of snout through eye above tympanum, and the back brown, with cream reticulations.

*Remarks.*—This species is common in Leyte, Mindanao, Palawan, and Busuanga. It is also known to occur in Culion, Dinagat, and Basilan, in the Philippines, and is reported from Celebes.\* The species is always found in the immediate vicinity of water, usually perched on rocks, in midstream. The frogs are extremely agile, and can make phenomenal jumps. They are captured with no little difficulty.

The types were collected in the Philippines, probably by Hugh Cuming; the exact type locality appears to be no longer known. The types, three in number, are in the British Museum.

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\* Boulenger, Proc. Zool. Soc. London (1897) 193-237, does not include the species in the Celebes fauna. He states that Meyer's record, Abh. Mus. Dresden 2 (1887) 16, of *Rana natatrix* Gthr. from Gorontalo is probably wrong.

Genus **POLYPEDATES** Tschudi

*Polypedates* TSCHUDI, Class. Batr. (1838) 34; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 515; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 77; COPE, Nat. Hist. Rev. (1865) 116; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 143.\*

*Theloderma* TSCHUDI, Class. Batr. (1838) 32.

*Buergeria* TSCHUDI, Class. Batr. (1838) 34.

*Rhacophorus* TSCHUDI, Class. Batr. (1838) 34; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 530; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 116; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 73 and 74; Fauna Brit. India, Rept. (1890) 470.

*Trachyhyas* FITZINGER, Syst. Rept. (1843) 31.

*Dendricus* GISTEL, Naturg. Thierr. (1848) 8.

Pupil horizontal; tongue free and deeply notched behind; vomerine teeth rarely absent; tympanum either distinct or hidden, rarely the latter; fingers more or less webbed or free; toes more or less webbed, terminating in disks; a small bone inserted between last two phalanges; terminal phalanges T-shaped. Outer metatarsals separated by a web; omosternum and sternum with a bony style.

This large genus of frogs is widely distributed from India and Madagascar to China, southern Asia, and the East Indian Archipelago. More than fifty species are known. There are seven well-differentiated forms represented in the Philippine fauna.

*Key to the Philippine species of Polypedates Tschudi.*

$\alpha^1$ . Tympanum distinct; skin of head not involved in cranial ossification.

$b^1$ . Fingers about one-third webbed; toes more than three-fourths webbed; cutaneous prominences below anus and on outer edge of arm and foot; heel reaches almost to tip of snout.

*P. appendiculatus* (Günther) (p. 80).

$b^2$ . Fingers about two-thirds webbed, membrane reaching disks of third and fourth fingers; toes webbed to base of disks; cutaneous flap over anus..... *P. pardalis* (Günther) (p. 82).

$b^3$ . Slight web at base of fingers; toes nearly entirely webbed; dorsolateral glandular folds present..... *P. hecticus* Peters (p. 87).

$b^4$ . Slight rudiment of web at base of fingers; toes three-fourths webbed; no dorsolateral glandular fold; small tubercles below vent, at heel, and on outer edge of forearm and tarsus.

*P. everetti* (Boulenger) (p. 88).

$\alpha^2$ . Tympanum distinct, large; skin of head involved in cranial ossification.

$b^1$ . Slight rudiment of web at base of fingers; toes nearly entirely webbed; disks of fingers half the diameter of eye.

*P. macrotis* (Boulenger) (p. 86).

$b^2$ . Differs from *P. macrotis* in having smaller choanæ and a narrower interorbital space; spotted above, or with four or six longitudinal stripes..... *P. leucomystax* (Gravenhorst) (p. 89).

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\* Stejneger (loc. cit.) has shown the necessity of the use of *Polypedates* instead of *Rhacophorus* for this genus of frogs.

a'. Tympanum nearly hidden under skin, about half size of eye; fingers with rudiment of web; toes a little more than one-half webbed.

*P. surdus* Peters (p. 92).

**POLYPEDATES APPENDICULATUS (Günther)**

PLATE 8, FIGS. 2, 2a, AND 2b

*Rhacophorus appendiculatus* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 79; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 86, pl. 8, fig. 4; BOETTGER, Ber. Senck. Nat. Ges. (1886) 122; Abh. Ber. Mus. Dresden 7 (1894-95) 2.

*Description of species.*—(From No. 184, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, P. I., September, 1912, by E. H. Taylor.) Vomerine teeth in two converging series, beginning on anterior inner edge of choanæ, not especially distinct; choanæ not large; head distinctly longer than wide; eye prominent, its diameter slightly longer than distance from eye to nostril; canthus rostralis rounded, the area about nostrils forming two small rounded prominences, with a slight depression between them; forehead not concave; lores concave, sloping obliquely; snout somewhat triangular, constricted in front of nostrils, forming a distinct "nose;" diameter of tympanum equal to, or a little more than, half diameter of eye, very close to orbit, the distance separating them about one-fifth to one-sixth diameter of tympanum; distance of nostril to end of snout contained one and one-half times in its distance from eye; a very distinct skin fold from eye to arm above tympanum; skin rough, tubercular, or warty, especially on head, snout, and shoulders, and on sides of head about tympanum; skin on posterior part of back as well as on the limbs rather smooth; chin and chest smooth; belly and under aspect of thighs strongly granular; hand slightly less than one-third webbed; digits with broad disks, equal to, or slightly smaller than, tympanum; first finger shorter than second, fourth longer than second, reaching terminal disk of third; subdigital tubercles prominent; a very slight skin fold from base of third finger along inner arm; toes more than three-fourths webbed, the webs reaching to near base of disks on outer sides of toes; disks smaller than those on fingers; third and fifth toes of equal length; inner metatarsal tubercle well developed, outer indistinct or wanting; a decided, undulous skin fold along outer side of fifth toe and tarsus, and on outer part of forearm; two small cutaneous prominences below anus; hind limb brought forward, tibiotarsal articulation reaches to near tip of snout.

*Color in life.*—Above, light brownish lavender on head, back, and sides, and above limbs; two broad, rather irregular stripes

of light pale lavender to whitish from eye to groin; below creamy white.

*Measurements of Polypedates appendiculatus (Günther).*

|                         | mm.  |
|-------------------------|------|
| Length, snout to vent   | 41   |
| Length of head          | 15   |
| Width of head           | 13.6 |
| Length of snout         | 7.5  |
| Diameter of eye         | 5.1  |
| Diameter of tympanum    | 3.5  |
| Diameter of finger disk | 3.5  |
| Foreleg                 | 24.5 |
| Hind leg                | 64   |
| Tibia                   | 22   |

*Variation.*—The chief variations noted in a series of about twenty specimens from Bunawan, Agusan, are as follows: The larger percentage of the specimens has the skin on the anterior part of the body smooth; in younger specimens the "nose" is not so distinctly evident; older specimens usually have a minute, but distinct, dermal fold on underside of head, outlining the mandible. The color varies markedly; half-grown and young specimens are usually uniform lavender above, and whitish below. Older specimens vary from purplish brown to gray, with indistinct spots and mottlings; the light lateral stripes are only rarely present; in certain specimens the hind legs are distinctly barred.

*Remarks.*—This species was especially common at Bunawan. The specimens for the most part were collected from the axils of the large caladiums that are found in profusion in the cut-over forests and along the rivers. Their eggs are deposited in the water that collects in the axils of caladiums and wild plantains.

The type locality is "Philippines," with no definite locality given. Known from Dinagat, Mindanao, and the Calamian Islands, in the Philippines. Reported also from Borneo.

**POLYPEDATES PARDALIS (Günther)**

PLATE 4, FIG. 1; PLATE 6, FIGS. 2 AND 2a

*Rhacophorus pardalis* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 83, pl. 6, fig. D; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 91; BOETTGER, Ber. Senck. Nat. Ges. (1886) 123; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 449.

*Rhacophorus reinwartii* EYDOUX and SOULEYET, in Voy. Bonite, pl. 10, fig. 1.

*Rhacophorus rizali* BOETTGER, Abh. Ber. Mus. Dresden 7 (1898-99) 1.

*Description of species.*—(From No. 1410, E. H. Taylor collection; collected in swamp between Gibong and Simulao Rivers,

Agusan, Mindanao, P. I., April, 1913, by E. H. Taylor.) Vomerine teeth in two straight, or slightly converging, series, arising from anterior inner edge of the large, oval choanæ, and separated from each other by a distance greater than the length of one group; Eustachian tubes with large visible openings; tongue broad, very deeply notched, with rather long horns behind (male with internal vocal sac, the openings near inner angle of mouth); head distinctly broader than long; eyes rather prominent, interorbital width about one and one-half times the width of upper eyelid; canthus rostralis indistinct, rounded, rather concave between eye and nostril, making snout rather narrower behind nostrils than farther forward; nostrils on tip of snout; distance from nostril to end of snout contained in distance of nostril to eye about four times; lores sloping slightly, not or scarcely concave; snout high; a slight but distinct depression between nostrils and a slightly concave area in forehead; diameter of eye equal to its distance from nostril; tympanum large, distinct, separated from orbit by a distance less than one-half its diameter, and equal to a little more than half diameter of eye; a very slight supratympanic fold; skin above smooth, skin on head not involved in the cranial ossification; skin on belly and on lower aspect of thighs strongly granular; anal region covered with a broad flap of skin, which is free to tip of coccyx; very broad disks on ends of broad flat fingers, diameter of disks of two outer fingers larger than tympanum and more than two-thirds eye; fingers broadly webbed; web between first two digits extends from subarticular tubercle of first to slightly above that of second; web between other fingers extends to base of disks; a large, very hard tubercle at base of first finger, about one-third the length of digit; a distinct skin fold from base of third finger along inner side of arm to its insertion; a very slight fold on outer edge of fourth finger, continued on outer side of forearm; no trace of webs on hind leg; toes webbed to base of disks, which are smaller than those of fingers; fifth toe longer than third; a slight fold along outer side of fifth toe continued to heel; heel with a slight dermal fold; fingers and toes with decided kinks at upper base of disks, and a slight triangular depression on upper part of each disk; tibiotarsal articulation fails slightly to reach nostril.

*Color in life.*—Above, head and body and sides light reddish to orange brown with slightly darker brown markings; a darker brown band between eyes; entire upper surface speckled and mottled with brilliant orange-yellow spots and blotches, more numerous on shoulders; limbs yellow, with darker distinct broad

bands of brown, and on the broader yellow interspaces single narrow brown lines with numerous small brown dots; digits and fingers dusky; a rather distinct brown line from anus to knee on hinder part of thigh; anal flap dusky with numerous small dark brown dots; below anus a large white spot, below which are scattered brown dots; membrane between toes yellowish with dusky markings, most noticeable between outer toes and fingers, usually an orange spot in the middle of the dark area; a dark brown line along the skin fold on outer side of hand and foot; chin, belly, and underside of limbs canary to lemon yellow; chin with a few brown spots outlining edge of mandible; a few dusky spots on sides near groin.

*Measurements of Polypedates pardalis (Günther).*

|                                | mm.  |
|--------------------------------|------|
| Length, snout to vent          | 65   |
| Length of head                 | 23.5 |
| Width of head                  | 25.6 |
| Depth of head, in front of eye | 7.2  |
| Diameter of tympanum           | 5    |
| Diameter of eye                | 7.3  |
| Length of snout                | 11   |
| Foreleg                        | 41   |
| Hind leg                       | 106  |
| Width of toe disk              | 5.5  |
| Tibia                          | 36   |

*Variation.*—A male taken at the same time is much smaller, and strikingly different in color. Length, snout to vent, 55 millimeters. The ground color is bright orange yellow with a very narrow, irregular line across the eyes and another, slightly wider and more irregular, across snout in front of eyes; a dim irregular light brown blotch between shoulders and another small group of dark dots on middle of back; entire upper surface with scattered, small, round, brown dots; limbs dotted or with short irregular lines; barring on limbs not or scarcely evident. The webs between toes slightly shorter; that is, the web does not reach the disks, except on outer side of second and third toes. The webs between fingers are also shorter, not reaching the disks on any of the fingers.

A specimen from Luzon shows some slight differences. I append a rather complete description (No. 10, Bureau of Science collection). Vomerine teeth in two short series arising from anterior inner edge of choanæ, not curving, converging but slightly, and widely separated from each other; Eustachian tubes with large visible openings near inner angle of mouth; tongue broad, deeply notched behind; head as broad as long; eyes

prominent; deep interorbital region, its width a little greater than the width of one eyelid; canthus indistinct, rounded, not or but very slightly concave between eye and nostril; snout not squarish, but sloping from nostrils to a low slight point; distance of nostril from end of snout contained about twice in distance of nostril to eye; lores sloping greatly, not or but slightly concave; diameter of eye reaches to half the distance between nostril and end of snout; tympanum distinct, scarcely more than half the diameter of eye, partly covered by the distinct skin fold which continues from eye to arm; distance of tympanum from eye equals about one-third its diameter; skin smooth above, skin of head not attached to head bones; sides of neck very slightly granulate; strongly granulate on belly and on underside of thigh; a flap of skin over anus free about halfway to end of coccyx; digits of hand with broad disks; webs between first two fingers up to subarticular tubercle; web of second finger on outer side extends to base of disk, but fails to reach base of disk of third finger; web between third and fourth fingers also fails somewhat to reach disks; first finger shorter than second, which in turn is shorter than fourth; large tubercle on thumb nearly equal to half length of the digit; a slight web from base of third finger along inner side of arm; disks of toes smaller; toes webbed, the web failing to reach disks on inner side of second and on either side of third; dermal fold on fifth toe and on foot very slight; cutaneous appendage on heel prominent; tibiotarsal articulation fails to reach nostril.

*Color in alcohol.*—Dusky, with a large, dim, irregular brown spot on occiput partly involving the supra- and interocular areas, and another large brownish blotch on posterior part of back; large yellowish white spots on shoulders, and an occasional whitish spot on back, more numerous on sides and in sacral region; limbs dimly barred with dusky, with an occasional whitish spot; white spot below anus; web between last fingers and toes with dusky marks; below without markings.

*Measurements of Polypedates pardalis (Günther).*

|                                | mm.  |
|--------------------------------|------|
| Total length, snout to vent    | 60   |
| Width of head                  | 21   |
| Length of head                 | 22   |
| Diameter of eye                | 7.2  |
| Diameter of tympanum           | 3.5  |
| Depth of head, in front of eye | 4.8  |
| Foreleg                        | 42.5 |
| Hind leg                       | 95   |
| Diameter of toe disk           | 4.8  |
| Snout, length                  | 9.8  |

*Remarks.*—This specimen differs from the Mindanao specimen by the following characters which appear very slight: Nostril not so near end of snout; snout not so high, lores sloping more; end of snout not so truncate; tympanum nearer eye; eye-to-arm fold more distinct; distance of eye and nostril from mouth less; tympanum somewhat smaller; the webbing of feet and toes agrees with that in the male described from Mindanao save that on one or two fingers the web reaches the disk on one side.

That *Rhacophorus rizali* Boettger is a synonym of this species is scarcely to be doubted.\* A photograph of the type specimen in Germany is in my collection. It agrees very well with my Mindanao specimens.

The two Mindanao specimens, a male and a female, were copulating when taken. They were found on the side of a tree about 3 meters from the ground, just above a small cavity filled with water. No eggs were found. The two forms were so strikingly different in coloration and size that it seemed two species were at hand. It is certainly a rare species in Agusan Valley. Although remarkably familiar with the fauna and flora of the forests, the natives to whom these specimens were shown had never seen the species.

#### POLYPEDATES MACROTIS (Boulenger)

*Rhacophorus macrotis* BOULENGER, Ann. & Mag. Nat. Hist. VI 7 (1891) 282; VI 14 (1894) 87.

*Description of species.*—"Vomerine teeth in two oblique groups on a level with the front of the choanæ, which are very large. Head nearly as long as broad; skin adherent to the frontoparietals, which are rugose, studded with granules; snout triangular, a little longer than the diameter of the orbit; canthus rostralis angular; loreal region concave; nostril near the tip of the snout; interorbital space (in the middle) not wider than the upper eyelid, the frontoparietal bones narrowing posteriorly; tympanum very distinct, as large as the eye. Fingers long, with a distinct rudiment of a web; toes nearly entirely webbed; disks of fingers about half the diameter of the eye, of toes smaller; subarticular tubercles moderate; a very small inner metatarsal tubercle. Tibio-tarsal articulation reaching the tip of the snout; tibia half as long as head and body. Skin smooth, granular on belly and under thighs.

*Color.*—"Grey-brown above, with a few small dark brown spots; loreal region greyish white; a dark brown band from the end of the snout through the nostril, the eye, and the tympanum to

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\* See Zool. Record, Rept. (1897) 30.

the side of the body; on the tympanum this band expands into a large temporal blotch; limbs with ill-defined dark cross bands; hinder side of thighs brown, dotted with white; lower parts whitish speckled with brown.

"From snout to vent 78 millim." (*Boulenger.*)

*Remarks.*—This species was described from a female specimen from Baram, Borneo. It belongs to the group of *Polypedates maculatus*. "It differs from all the species of that group in the larger tympanum, from *R. maculatus* and *R. cruciger* in the absence of a parieto-squamosal arch, and in the larger choanæ, from *R. leucomystax* in the narrower interorbital space and the larger choanæ, and from *R. colletti* in the shorter hind limbs." (*Boulenger.*)

From the Philippines this species is known only from Palawan, where it was obtained by A. Everett.

#### POLYPEDATES HECTICUS Peters

*Polypedates hecticus* PETERS, Mon. Berl. Ak. (1863) 457.

*Rhacophorus hecticus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 78; BOETTGER, Ber. Senck. Nat. Ges. (1886) 122; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1896) 448; FLOWER, Proc. Zool. Soc. London (1899) 898 (uncertain).

*Description of species.*—(From the type description.) Vomerine teeth in two oblique converging series between the choanæ; tongue cordiform; openings of the Eustachian tubes larger than choanæ; head almost one-fifth longer than broad, flat, with protruding eyes; diameter of eyes nearly as great as length of snout; snout projecting, rounded in front of nostrils; frenal region concave; nostril nearer tip of snout than eye; canthus rostralis distinct; tympanum very distinct and large, distinctly longer than high, about two-thirds the diameter of eye; skin on back granulated; a well-defined dorsolateral fold present from eye to end of body; a fold from corner of mouth, below tympanum, to axilla; forearm reaching end of body with longest finger; disks of fingers very large, broadly cordiform in shape, rather pointed anteriorly; a slight web present at base of fingers; first finger shorter than second, with smaller disk; subarticular tubercles well developed; a skin fold on inner side of arm; fifth toe longer than third; toes almost entirely webbed, the membrane not including last two joints of fourth toe; disks similar to those on fingers, but smaller; two metatarsal tubercles; a fold of skin on outer toe; tibiotarsal articulation reaches beyond end of snout; skin granular or tubercular above. Male without vocal sac.

*Color*.—Above grayish blue, the fold on back white, bordered by black; a white line from tip of snout along upper lip, widening below and in front of tympanum and continuing to insertion of arm; dark spots on temporal region, one in front, one behind tympanum, which sharply defines the light line; pale blue low on sides, with small blackish flecks; limbs brownish with more or less distinct flecks, especially on posterior aspect of thigh; below on body, white.

*Measurements of Polypedates hecticus Peters.*

|                         | mm. |
|-------------------------|-----|
| Total length            | 51  |
| Length of head          | 17  |
| Width of head           | 14  |
| Foreleg                 | 35  |
| Hand, with third finger | 17  |
| Hind leg                | 84  |
| Foot, with fourth toe   | 37  |

*Remarks*.—The type, which appears to be the only specimen recorded from the Philippines, is a full-grown male specimen collected at Loquilocum, Samar, by F. Jagor.

Flower has reported a frog which appears to be a specimen of this species, from Malay Peninsula, but expresses a doubt as to whether it is correctly classified.

**POLYPEDATES EVERETTI (Boulenger)**

*Racophorus everetti* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 87.

*Description of species*.—"Vomerine teeth in two oblique groups between the moderately large choanæ. Head slightly broader than long, without dermal ossification. Snout rounded, shorter than the diameter of the orbit; canthus rostralis obtuse, curved; loreal region concave, very oblique; nostrils near the end of the snout; interorbital space as broad as the upper eyelid; tympanum distinct, two fifths the diameter of the eye. Fingers with a slight rudiment of web; disks moderate, nearly as large as the tympanum; toes three-fourths webbed; inner metatarsal tubercle very small; no tarsal fold. Tibio-tarsal articulation reaching a little beyond the tip of the snout. Skin finely granulate above, coarsely beneath; small conical tubercles below the vent, at the heel, and along the outer edge of the forearm and tarsus. Pale yellowish or reddish brown above, with dark brown markings; the most conspicuous of these are a cross band between the eyes and a symmetrical marking on the præsacral part of the back, roughly representing a frog with the four limbs stretched out; limbs with dark cross bands; lower parts uniform white.

"From snout to vent 32 millim." (*Boulenger.*)

*Remarks.*—This rare species is known from two specimens collected by A. Everett in Palawan.

POLYPEDATES LEUCOMYSTAX (Gravenhorst)

PLATE 2, FIG. 4

*Hyla leucomystax* GRAVENHORST, Delic. Mus. Vratisslav. (1829) 26.

*Hyla sexvirgata* GRAVENHORST, Delic. Mus. Vratisslav. (1829) 28.

*Hyla quadrilineata* WIEGMANN, Nova Acta Acad. Leop.-Carol. 17 (1835) 260, pl. 22, fig. 1.

*Polypedates leucomystax* TSCHUDI, Class. Batr. (1838) 75; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 520; KELAART, Prodr. Faun. Zeyl. (1852), 193; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 157.

*Polypedates rugosus* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 520.

*Polypedates quadrilineatus* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 79.

*Polypedates megacephalus* HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia (1860) 507.

*Rhacophorus maculatus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 83; var. *quadrilineata*, 84; Proc. Zool. Soc. London (1889) 30.

*Polypedates maculatus* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 78; Rept. Brit. India (1864) 428; BLANFORD, Journ. As. Soc. Bengal (1870) 376; ANDERSON, Proc. Zool. Soc. London (1871) 307; STOLICZKA, Proc. As. Soc. Bengal (1872) 106.

*Polypedates biscutiger* PETERS, Mon. Berl. Ak. (1871) 644.

*Hylorana longipes* FISCHER, Archiv. Naturg. 51 (1885) 47.

*Rhacophorus leucomystax* var. *sexvirgata* BOULENGER, Proc. Zool. Soc. London (1889) 30.

*Description of species.*—(From No. 686, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, P. I., June 24, 1913, by E. H. Taylor.) Vomerine teeth in two slender diagonal series, beginning at some distance from anterior inner edge of choanæ, and separated from each other by a distance equal to their distance from choanæ; distance between Eustachian tubes equals their distance from nostrils; distance between choanæ much greater than distance between nostrils, equaling distance from eye to nostril; head a little longer than broad; interorbital area and a large area on snout depressed; canthus rostralis roundly angular, nostrils lateral, below level of choanæ; diameter of eye equal to its distance from nostril; nostril two and one-half times as far from eye as from tip of snout; tympanum large, its greatest diameter slightly less than diameter of eye, separated from the latter by a distance less than one-third its diameter; interorbital distance one and one-half times upper eyelid; latter equal to distance between nostrils; skin of body above minutely granular and apparently smooth in patches; skin of head, save a small area in frontal region, involved in cranial

ossification; sides wrinkled and granular; throat and breast nearly smooth; belly very strongly granular, part of femur less so; a strong glandular fold from eye, curving above tympanum, then running backward and slightly downward some distance on side; this does not reach below the middle level of tympanum; fingers broad, all except first with large disks, that on first finger small; each digit with a deep groove around edge and a slight groove across face of disk; a very strong kink at base of disk; a rudiment of web at base of fingers very distinct; a distinct skin fold from base of third finger, continued above along inner arm; subarticular tubercles of hand very strong; first finger a little shorter than second; fourth finger reaching more than halfway on disk of third; a slight fold on outer side of fourth finger and outer side of forearm; toes from one-half to two-thirds webbed, membrane not reaching base of disks; disks smaller than finger disks; subarticular tubercles rather distinct; a blunt inner metatarsal tubercle and a very obscure outer; a very dim fold on outer side of fifth toe and tarsus; tibiotarsal articulation reaching slightly beyond tip of snout.

*Color in life.*—Above olive brown, with four darker brown, broken, irregularly widened stripes, two beginning on tip of snout and two on the eyelids; loreal region dark brown, lighter on lip; a broad dark stripe beginning behind tympanum and continuing some distance on side; legs barred with darker brown; posterior aspect of thigh brown, dotted with yellow; below yellow-cream; throat with dusky brown flecks; posterior part with canary yellow wash; sides brown, reticulated with yellow-cream; palms and soles purplish.

*Measurements of Polypedates leucomystax (Gravenhorst).*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 81   |
| Length of snout       | 13   |
| Length of head        | 32   |
| Width of head         | 29   |
| Diameter of eye       | 8.5  |
| Diameter of tympanum  | 7.5  |
| Eye to nostril        | 9    |
| Interorbital distance | 10.5 |
| Foreleg               | 51   |
| Longest finger        | 23   |
| Hind leg              | 148  |
| Femur                 | 41   |
| Tibia                 | 43.5 |
| Foot                  | 51.5 |
| Longest toe           | 36   |
| Finger disk           | 4.7  |
| Toe disk              | 3.5  |

*Variation.*—The large synonymy is evidence of a great amount of variation in this species. In Philippine specimens the color and markings vary greatly; but relative measurements and proportions are rather constant, save in the case of the tympanum, which varies from one-half to nearly full size of the eye.

The markings are usually in four to six longitudinal lines, as described above (*Polypedates quadrilineatus*), or broken into numerous spots which do not conform to the outline of this design (*P. maculatus*); spots may be numerous or few, sometimes almost wanting. The ground color varies from very light yellow or whitish to dark purplish brown; sometimes (in life) almost black, with no markings visible. One of my specimens, taken in Mindanao, was bright lemon yellow over the entire body when first captured, with no markings. After being kept some time the yellow became grayish, and dim longitudinal stripes appeared.

Wiegmann had a Manila specimen collected by Meyen for the type of his *Hyla quadrilineata*. One of the types of *Polypedates rugosus* Duméril and Bibron was from Manila.

It is significant that the *Polypedates maculatus* form is rarely, if ever, found in Mindanao; in a collection of more than fifty specimens from Bunawan not one occurs. On the other hand, Manila specimens are largely of that type.

*Tadpoles.*—Mandibles broadly edged with black, the upper forming a strongly arched, curved series, the lower a strongly V-shaped series; lower edge of lip with numerous papillæ; upper labial extension with four series of mandibular teeth, the first uninterrupted, the second barely interrupted medially, the other two series very short, separated by mouth; lower labial extension with three uninterrupted series.

*Color.*—Yellowish brown to olive brown above, with black spot on nose and nostrils; a bright yellow spot on point of snout, purplish on throat, lighter on belly; tail olive, the crests colorless.

It will be noted that these specimens differ from Flower's description, in that in the form described above there are only four instead of five series of small teeth on upper lip, and that the three series on lower lip are uninterrupted. Flower\* also mentions a variation in a Singapore specimen. It may be possible to differentiate the various races or subspecies of *Polypedates leucomystax* by the characters of the tadpoles.

*Remarks.*—The species occurs over the entire Archipelago; it has been reported from many localities in Luzon, and from Mindoro, Samar, Leyte, Negros, the Calamianes, Mindanao, and

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\* Proc. Zool. Soc. London (1899) 899.

Palawan. I failed to get specimens in the Sulu Archipelago; but it very probably occurs there as I found specimens in Zamboanga, and in Borneo on the coast nearest the southern end of the Sulu Archipelago.

There appears to be no definite breeding season for the species. In Baguio, northern Luzon, I found floating masses of fertile eggs in December and May. In Manila I have found them in June and July. In Mindanao a number of egg masses were collected from branches above pools of water in September. One mass taken contained seven hundred eighty-six eggs.

#### POLYPEDATES SURDUS Peters

*Polypedates surdus* PETERS, Mon. Berl. Ak. (1863) 459.

*Rhacophorus surdus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 79; BOETTGER, Ber. Senck. Nat. Ges. (1886) 122; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 449.

*Description of species.*—Vomerine teeth in two short oblique series, beginning on inner edge of choanæ and lying between and behind them; tongue cordiform, very deeply notched behind; choanæ smaller by almost one-half than openings of Eustachian tubes. Head as broad as long; distance between anterior corners of eyes equal to their distance from point of snout; canthus rostralis distinct; distance between nostrils equal to their distance from eye; nostrils nearer end of snout than eye; loreal region concave; tympanum entirely covered, but its outline more or less visible, the diameter equaling about half the eye; diameter of eye shorter than snout; foreleg reaches almost to back end of body; fingers with rudiments of a web; finger disks large, rounded, that on first finger small; first finger shorter than second, fourth longer than first or second; subarticular tubercles and carpal tubercles large; tibiotarsal articulation reaches tip of snout; toes a little more than half webbed, last two joints of fourth and last joints of the others free; disks of toes larger than those of fingers; fifth toe very little longer than third; subarticular tubercles and the two metatarsal tubercles well developed; skin with a few small tubercles above; below, entire surface granular.

*Color.*—Above dark brown; a small stripe on point of snout and a larger one on lip in front of eye; a greenish white stripe from eye to axilla; sides of body whitish, marbled with brown; below brownish, throat speckled with yellowish; legs with brown bars; posterior aspect of thigh marbled with brown.

*Measurements of Polypedates surdus Peters.*

|                                   | mm.  |
|-----------------------------------|------|
| Length, snout to vent             | 26   |
| Length of head                    | 10   |
| Width of head                     | 10.5 |
| Foreleg                           | 19.5 |
| Length of hand, with third finger | 9    |
| Hind leg                          | 43   |
| Foot and fourth toe               | 19.5 |

*Remarks.*—The species was discovered in Luzon by F. Jagor. It appears to have been founded on a single specimen, and I believe it has not been rediscovered in the Islands.

**Genus HAZELIA Taylor**

Upper jaw with teeth; no vomerine teeth; head with well-defined bony ridges; a low supratemporal ridge; tympanum distinct; no ridges across palate in front of œsophagus; fingers unwebbed, with large disks; a distinct kink above disk, caused by a bone intercalated between last two phalanges; terminal phalanges bifurcate; body covered with spiny tubercles; toes partly webbed; pupil horizontal. This genus is named for my wife, Hazel Clark Taylor, who has assisted me greatly in making collections and in the preparation of this work.

Type, *Hazelia spinosa* Taylor.

This genus combines certain characters of *Philautus* and *Polypedates*; it has the intercalated bone between the last two phalanges on each digit; the vomerine teeth are wanting as in *Philautus* (rarely wanting in *Polypedates*); the terminal phalanges are bifurcate, shaped something between a Y and a T; the bony crests on head are not unlike those found in certain species of *Bufo*.

**HAZELIA SPINOSA Taylor**

## PLATE 7, FIG. 1

*Hazelia spinosa* TAYLOR, Philip. Journ. Sci. 16 (1920) 292.

*Type.*—No. 406, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August, 1912, by E. H. Taylor.

*Description of type.*—No vomerine teeth present; choanæ large, elongate, lying somewhat back under edge of jaw, but plainly visible; tongue elongate, divided behind, with two small rounded "horns;" no papilla present; head longer than wide; snout rather truncate, high, sloping downward and backward toward mouth, upper part extending farther forward than mouth;

snout with distinct, prominent canthus rostralis; rather concave between eye and nostril; snout slightly narrower behind nostrils than elsewhere; loreal region rather concave, lores rather vertical on upper part, then sloping to mouth; nostrils very near tip of snout, distance of nostril from tip contained in distance to eye four or five times; eye large, its diameter about equal to its distance from nostril; tympanum very distinct, lying very close to eye, its diameter about four-fifths that of eye; two bony ridges form continuations of the canthi, beginning in front of eye and continuing on either side of interorbital region to occiput; distance between ridges greatest anterior to eye; interorbital region depressed, its width about one and one-half to one and two-thirds times as great as upper eyelid; a slight ridge above tympanum; temporal region slightly concave; fingers unwebbed, with distinct, transversely widened disks; each disk with a distinct groove around outer edge, continuous with a transverse groove crossing near middle of disk below; a decided kink between last two phalanges; first finger shorter than second, which in turn is much shorter than fourth; fourth finger reaches base of disk of third; toes about one-third to one-half webbed, the membrane reaching subarticular tubercle of first and second toes, and a little higher on third; third and fifth toes of unequal length; disks of toes smaller than those of fingers; subarticular tubercles well developed; a prominent inner, and a small outer, metatarsal tubercle; tibiotarsal articulation reaching slightly beyond tip of snout, when carried forward; skin above covered with hard, spiny granules and tubercles, giving a very spiny appearance; skin of anterior part of head grown solidly to skull and bony ridges; tubercles are present on upper surface of limbs and fingers, on side of head, and even under digits; eyelids extremely rugose; chin with minute tubercles; belly granulate; inner aspect of thighs and tibia smooth.

*Color in life.*—Above brownish, darker on anterior part of head, with scattered lemon yellow to orange spots; two prominent darker-edged interscapular orange spots above and slightly behind tympanum; smaller yellow spots in superciliary region, along lip and canthus rostralis, below tympanum and along both sides of back; one small prominent spot on tip of snout; limbs above brownish; reddish orange on anterior and posterior aspects of arms and legs, with two yellow darker-edged spots on arms, and larger, rather regularly disposed yellow spots on legs; belly, sides, and undersides of limbs orange yellow; fingers and toes with yellow spots.

*Measurements of Hazelia spinosa Taylor.*

|                             | mm.  |
|-----------------------------|------|
| Total length, snout to vent | 41   |
| Width of head               | 13   |
| Length of head              | 16   |
| Diameter of eye             | 5.2  |
| Diameter of tympanum        | 4    |
| Foreleg                     | 26   |
| Longest finger              | 13   |
| Hind leg from vent          | 67.5 |
| Femur                       | 21   |
| Tibia                       | 22   |
| Foot and heel               | 26   |
| Longest toe                 | 15   |

*Variation.*—The specimen here described was collected in Bunawan, Agusan, Mindanao, in 1912. In 1917 I discovered the species in Basilan, at a point on the west coast directly opposite the small island of Great Govenen. Most of the specimens taken were darker than the Agusan specimen, their bellies were orange, with numerous rather large yellowish white spots on sides of the belly and chin. The number and prominence of the dorsal yellow spots vary, some specimens having very few spots on head and legs; the spiny granules on heels and below anus are yellowish. In the type the third toe is distinctly longer than the fifth; in Basilan specimens they are equal or nearly so, and the distance from nostril to tip of snout is less.

*Tadpoles.*—A few tadpoles of this species were taken with the adults; also an immature specimen, which had just completed its transformation.

*Description of tadpole.*—Length, with hind legs, 6.5 millimeters; body nearly one and a half times as long as broad, but much shorter than tail; depth of tail in tail length more than four times; nostrils much nearer end of snout than eye; eyes on upper surface of body; distance between them equal to their distance from nostrils; a deep trough-shaped groove between and behind eyes, continued forward as a narrow linear groove to end of snout; in front of eyes, and somewhat below, are two large rounded pouches; mouth narrow; inside the mouth, and almost concealed, are two series of teeth which are a deep dark brown; the upper is curved with only a very small angle; the lower series rather V-shaped; these teeth plates seemed to be wanting in older specimens of the tadpoles. The specimens are in a rather indifferent state of preservation, and I am unable to determine the character of the upper and lower labial teeth.

*Color in life.*—Dark brown to black; belly rather lighter; older specimens have minute yellow spots, and by the time the anterior limbs have sprouted, the shoulder spots are evident.

*Remarks.*—The adults and tadpoles from Basilan were taken in a small hole filled with water and rotting leaves in a tree trunk about one-half meter from the ground. No specimens had been observed, but when the hole was emptied the adults and tadpoles were taken from the bottom. The adults are very active and jump with great rapidity; it is probable that their apparent rarity is due to the fact that for the most part they are arboreal; they feed largely on ants. It is noteworthy that among the leaves and trash found in the water there were great numbers of aquatic ants. In the character of the finger disks this species resembles *Polypedates*. None of the specimens appears to have vocal sacs.

The species is known only from Bunawan, Agusan, Mindanao, and Basilan, in the Philippines.

#### Genus *PHILAUTUS* Gistel

*Philautus* GISTEL, *Naturg. Thierr.* 10 (1848); STEJNEGER, *Proc. U. S. Nat. Mus.* 28 (1905) 346; \* BARBOUR, *Mem. Mus. Comp. Zool. Harvard Coll.* 44 (1912) 69.

*Ixalus* DUMÉRIL and BIBRON, *Erp. Gén.* 8 (1841) 523; GÜNTHER, *Cat. Batr. Sal. Brit. Mus.* (1858) 74; COPE, *Nat. Hist. Rev.* (1865) 116; BOULENGER, *Cat. Batr. Sal. Brit. Mus. ed. 2* (1882) 93.

*Orchestes* TSCHUDI, *Class. Batr.* (1838) 76.

*Leptomantis* PETERS, *Mon. Berl. Ak.* (1867) 32.

"Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth none. Tympanum distinct or hidden. Fingers free or webbed at the base; toes webbed; tips of fingers and toes dilated into regular disks. Outer metatarsals separated by a groove or narrow web. Omosternum and sternum with a bony style. Terminal phalanges obtuse." (*Boulenger.*)

*Remarks.*—This genus is closely related to *Polypedates* Tschudi and *Staurois* Cope. External differences between the species of the genera are indeed meager, as certain *Polypedates* have no vomerine teeth and these are also wanting in *Staurois*. The Philippines are rich in species of this genus, no less than seven having been described heretofore, and two new ones are included in this catalogue, both quite clearly differentiated from other known forms.

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\* Stejneger has shown that this name must take precedence over *Ixalus* Duméril and Bibron, which is preoccupied by *Ixalus* Ogilby, 1836, for a genus of mammals.

*Key to the Philippine species of Philautus Gistel.*

- a*<sup>1</sup>. Fingers free; first finger shorter than second, not opposed to others.
- b*<sup>1</sup>. Toes webbed at base.
- c*<sup>1</sup>. Heel reaches beyond tip of snout; snout with conical projection; tympanum dim, less than one-half eye; interorbital space wider than eyelid; skin shagreened above; 29 mm; Mindanao.  
*P. woodi* Stejneger (p. 97).
- c*<sup>2</sup>. Heel reaches eye; snout rounded; tympanum dim, about one-third of eye; interorbital space equals upper eyelid; tubercle on eyelid and heel; skin entirely smooth above; male with vocal sacs; 34 mm; Canlaon Volcano, Negros..... *P. hazelæ* Taylor (p. 99).
- b*<sup>2</sup>. Toes one-third webbed.
- c*<sup>1</sup>. Heel reaches beyond tip of snout; tympanum hidden; skin shagreened above; interorbital space broader than eyelid; 20 mm; Leyte..... *P. leitensis* (Boulenger) (p. 102).
- c*<sup>2</sup>. Heel reaches nostril or tip of snout; skin smooth above; tympanum distinct, one-third to two-fifths eye; 29 mm; Mount Dulangan, Mindoro..... *P. mindorensis* (Boulenger) (p. 104).
- b*<sup>3</sup>. Toes one-half webbed. Heel reaches far beyond tip of snout.
- c*<sup>1</sup>. Two converging ridges on shoulders; skin rough; tympanum distinct, equaling two-fifths eye; interorbital space wider than eyelid; male with vocal sac; 21 mm; Palawan.  
*P. longicrus* (Boulenger) (p. 104).
- c*<sup>2</sup>. No converging ridges; skin smooth; tympanum one-fourth size of eye; 18 mm; Mindoro..... *P. schmackeri* (Boettger) (p. 103).
- b*<sup>4</sup>. Toes nearly entirely webbed; snout pointed; tympanum small, covered with skin; skin smooth, with granules on back and eyelid; 22 mm; eastern Mindanao..... *P. acutirostris* (Peters) (p. 105).
- a*<sup>2</sup>. Fingers partially webbed; first finger shorter than second and opposed to third and fourth.
- b*<sup>1</sup>. Fingers one-third to one-half webbed; first opposite rest; toes nearly entirely webbed; tympanum one-third eye, covered with skin; male with vocal sac; 34 mm; Agusan River, Mindanao.  
*P. bimaculatus* (Peters) (p. 105).
- b*<sup>2</sup>. Fingers not more than one-fifth webbed; first two opposite third and fourth; toes two-thirds webbed; tympanum distinct, about three-fifths eye; skin smooth; 39 mm; Bongao, Sulu Archipelago.  
*P. montanus* Taylor (p. 106).

**PHILAUTUS WOODI Stejneger**

*Philautus woodi* STEJNEGER, Proc. U. S. Nat. Mus. 28 (1905) 346.

*Description of species.*—"Snout longer than diameter of eye, with a pointed conical projection forming a distinct 'nose'; nostrils located nearer the tip of the snout than the eye; canthus rostralis sharp; lores very concave, the concavity continued forward beyond the nostrils; interorbital space wider than upper eyelid; tympanum scarcely distinguishable, apparently not larger than half the diameter of the eye; fingers free, first considerably shorter than second, which is to the same extent shorter than

fourth; disks of fingers rounded, large, especially those of third and fourth fingers; toes webbed at base only; disks well developed, about the size of those of second finger; subarticular tubercles well developed; a small oval inner metatarsal tubercle, no outer; no tarsal fold; hind legs being carried forward along the body, the tibio-tarsal articulation reaches a considerable distance beyond the tip of the snout; skin finely shagreened above, coarsely granular on the entire lower surface, including the throat, underside of limbs, and even hands and feet; a strong glandular fold from eye to shoulder; no dorsolateral fold.

*Color*.—(In formalin and transferred to alcohol.) "Above dark chocolate brown, with a hair fine pale line from tip of snout along the entire middle line of the body; snout from tip to a line across the middle of upper eyelids pale cinnamon in strong contrast; a large dusky mark behind this pale area on the interorbital space and involving the upper eyelids, though visible only with difficulty on account of the dark color of the rest of the upper surface; whole loreal and temporal area dark brown, apparently a shade darker than the back; flanks, anterior and posterior aspects of the thighs, underside of tibia and foot with a strong suffusion of a deep saturated burnt sienna; underside whitish with a number of irregular spots or patches of brown; a few irregular white spots on the sides of the body." (*Stejneger*.)

*Measurements of Philautus woodi Stejneger.*

|   | mm.  |
|---|------|
| Total length, from tip of snout to vent   | 29   |
| Width of head                             | 12.5 |
| Foreleg                                   | 19   |
| Hind leg, from vent to tip of longest toe | 55   |

*Remarks*.—*Stejneger* records variations in a second specimen as follows: "The entire dorsal surface is of the same color as the prefrontal area, so that the sides are marked by a very broad dark brown band from the nostrils backward. The transverse dark frontal band consequently also stands out in strong contrast." It is presumably most closely related to *Philautus leitenensis* from Leyte. It differs in the long acuminate and projecting snout, and the lesser extent of the webbing of the toes. The color is different. The types were collected on Mount Apo, Davao, Mindanao, at an elevation of nearly 2,000 meters, by E. A. Mearns, June 20, 1904. They are at present in the United States National Museum. The species has not been rediscovered.

## PHILAUTUS HAZELÆ Taylor \*

## PLATE 3, FIG. 2

*Philautus hazelæ* TAYLOR, Philip. Journ. Sci. 16 (1920) 298.

*Type*.—No. F293, E. H. Taylor collection; collected at an elevation of about 1,000 meters, on Canlaon Volcano, central northern Negros, December 25, 1916, by E. H. Taylor.

*Description of type*.—Vomerine teeth wanting; choanæ very small, near outer edge of the palate; tongue oval, the anterior part forming a rounded moundlike prominence, notched behind, forming two distinctly rounded horns, widely separated at base; head short, neither snout nor occipital region concave; canthus rostralis distinct, rather angular; loreal region concave, sloping obliquely to mouth; eye large, pupil horizontal, diameter of eye slightly less than distance from eye to end of snout; nostril much nearer end of snout than eye; distance between nostrils equals their distance from eye; interorbital space about equals width of upper eyelid; tympanum one-third to two-fifths the diameter of eye; skin of body, above, smooth, shiny; sides, belly, and underpart of thighs strongly granular; chin and underpart of arms smooth; a single, distinct rounded tubercle on posterior part of eyelid; a supratemporal fold from eye to arm; a short glandular fold behind and below tympanum, at angle of mouth, and another short fold above and in front of arm; a very prominent tubercle at end of tibia, with several smaller tubercles about it; fingers quite free with large transversely oval pads, much larger than tympanum; first finger only about two-thirds second, its disk very small but a little larger than the subarticular tubercles; second finger shorter than fourth; disk of fourth barely reaches base of disk of third; subarticular tubercles well developed, tubercles on palm not well defined; toes with a trace of web; toes with disks of unequal size; disk on fourth toe largest, but not equal to size of largest finger disk; an elongate tubercle on inner metatarsus, more than half the length of first toe; a very dim outer metatarsal tubercle; fifth toe longer than third; tibiotarsal articulation when brought forward reaches eye or a little beyond; each disk with a distinct groove around edge. Males with internal vocal sacs.

*Color in life*.—Above dark brown with a large, more or less regular, slate-black mark on back; head with a triangular spot on interorbital region; two elongate curving stripes on back; legs and digits barred with brown; belly bright canary yellow, mottled, reticulated, and spotted with brown; posterior part of

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\* Named for my wife, Hazel Clark Taylor.

belly and underpart of limbs and sides brown, with minute yellow punctations; labial region above with darker marks, below bordered by a rim of small irregular cream dots; groin with larger blotches of yellow.

*Measurements of Philautus hazelæ Taylor.*

|                                       | mm.  |
|---------------------------------------|------|
| Length, snout to vent                 | 34   |
| Length of head                        | 13   |
| Width of head                         | 14   |
| Length of snout, from eye             | 5    |
| Depth of snout, in front of eye       | 4.8  |
| Diameter of eye                       | 4.9  |
| Diameter of tympanum                  | 1.7  |
| Diameter of largest finger disk       | 2.2  |
| Foreleg                               | 21.5 |
| Longest finger, from wrist            | 11.1 |
| Hind leg                              | 53.5 |
| Femur                                 | 17   |
| Tibia                                 | 17   |
| Longest toe, from metatarsal tubercle | 16.8 |

*Variation.*—Color variations are very marked; practically no two specimens in my collection can be found alike. Several resemble the type in color and markings. No. F290 is gray, darker on loreal region, with a dim stripe on interorbital region; very dim, darker bars on limbs; belly grayish, with minute spots or reticulations of yellow; groin with yellow spots. Nos. F287, F297, F299, and F301 resemble No. F290 in general details. No. F296 is dark black-brown above, with an orange stripe from tip of snout to anus; below dusky brown, yellowish in groin. No. F291 is of a uniform pinkish drab color, with a few scattered black spots; irregular black stripes on both sides, strongly contrasted with the back color; yellowish below, with dusky markings; yellow spots in groin. No. F285 has the ground color gray, with a broad black band across head behind eyes, and a narrow one in front of eyes; a third shorter transverse stripe on shoulders, and another in the middle of the back, front limb strongly barred, hind limb dimly barred; groin with distinct yellow spots.

Although the type does not show them, many of the specimens have two small, rounded, distinct tubercles on shoulders, separated by a distance a little greater than the interorbital distance, occasionally a second pair is visible in the posterior third of back, more widely separated than the anterior pair; the tubercles on eyelid and on heel are constant. Most of the specimens have a small glandular swelling on the tip of the lower jaw. Some have the chin smooth; others granular, but with granules smaller than those of belly and thigh. In numerous specimens there

are faint raised rugosities in the place where the vomerine teeth usually appear, which in one or two cases have the appearance of slight series of vomerine teeth. This again emphasizes the fact that the vomerine teeth are not in themselves a generic character, and in many cases they cannot be relied upon even as a specific character.

A specimen recently captured in Culasi, Antique Province, Panay, in the mossy forest at 1,000 meters, by R. C. McGregor, is worthy of note; the eye has more than one tubercle, and the two pairs of tubercles on the back are quite distinct. In size it is much smaller than any specimen from Canlaon, measuring only about 15 millimeters from snout to vent. The color above is gray, with an interorbital band, with a small transverse black spot on shoulders, and a larger irregular spot in the middle of the back; on the sides of the head and low on the sides of the body are numerous black spots or reticulations; the arm is light with strong bars across hand and digits; hind leg and foot lightly barred with darker; yellowish spots in groin. There is no evidence of vomerine teeth. The swelling on the tongue appears to be wanting; the tubercle on heel and the swelling on the tip of lower jaw are present. Although apparently a very immature specimen, I have no hesitancy in referring it to this species.

*Remarks.*—This species abounds on Canlaon Volcano. It appears to breed in the axils of a particular species of wild abacá, in which habitat all the specimens were found. The axils appear always to be filled with water; no tadpoles were taken, but some very young specimens were found. All were captured in December. The color markings appear to have no fixed pattern, great variation in color and markings being encountered. The yellow spots in the groin are usually present. The skin on the head and back is very shiny and smooth. The specimen described appears to be a full-grown female.

The characters which clearly distinguish this species from other Philippine species of this genus are the much shorter limbs; the small tympanum; the smooth, shiny skin; the supra-orbital tubercle and the tubercle on heel; the very small first finger. Many other, less obvious characters are evident on a comparison of descriptions. The variation in markings and coloration in this species leads me to regard markings in this group as of little value in determining species. The webbing of fingers and toes seems to place this species near to *Philautus woodi* Stejneger from Mount Apo, Mindanao.

Known from Negros and Panay.

## PHILAUTUS LEITENSIS (Boulenger)

## PLATE 1, FIG. 3

*Ixalus leitensis* BOULENGER, Ann. & Mag. Nat. Hist. VI 19 (1897) 107.

*Description of species.*—(From No. B38, Bureau of Science collection; collected on Biliran Island, May, 1914, by R. C. McGregor.) Snout subacuminate, not projecting; head as broad as long; canthus rostralis distinct, loreal region somewhat concave, sloping rather than vertical; eye large, diameter of orbit minutely less than length of snout; tympanum partially outlined, covered with skin, very close to eye; nostril somewhat nearer tip of snout than eye; interorbital region distinctly wider than upper eyelid; a strong fold from eye to insertion of arm; skin finely shagreened above on head, back, and sides; belly strongly granular; granules large, mosaiclike; chin and throat smooth; fingers free, with large disks, first very small and slender, second shorter than fourth; a row of blunt tubercles on outer side of anterior part of arm; subarticular tubercles well developed; hind leg long; tibiotarsal articulation reaching slightly beyond tip of snout; toes about one-third webbed, third toe extending minutely farther than fifth; disks well developed; subarticular tubercles large; sole granular; a strong inner metatarsal tubercle; a row of indistinct tubercles along outer side of foot and heel; a rather prominent tubercle on end of tibia.

*Color in formalin.*—Above very light yellow-brown, with scattered dark brown spots, or groups of dots; a spot between eyes, one behind occipital region, one on either side of middle of back; a large spot in groin continuing on anterior part of thigh; posterior side of femur, tibia, and underside of tarsus brown; limbs dimly barred or spotted with brown above; belly immaculate cream.

*Measurements of Philautus leitensis (Boulenger).*

|                                       | mm.  |
|---------------------------------------|------|
| Snout to vent                         | 26   |
| Length of head                        | 11.5 |
| Width of head                         | 11.3 |
| Length of snout, from eye             | 6    |
| Depth of snout, in front of eye       | 3.8  |
| Diameter of eye                       | 5.2  |
| Largest finger disk                   | 2    |
| Foreleg                               | 18.5 |
| Hind leg                              | 45.  |
| Femur                                 | 13.5 |
| Tibia                                 | 15   |
| Longest toe, from metatarsal tubercle | 10   |

*Remarks.*—This specimen appears to be the second one known. The type was discovered in Leyte by John Whitehead and was presented to the British Museum.

PHILAUTUS SCHMACKERI (Boettger)

*Ixalus schmackeri* BOETTGER, Kat. Bat.-Samml. Mus. Senck. Nat. Ges. (1892).

*Description of species.*—Tongue pear-shaped, deeply notched behind, without papilla; head large, broader than back; snout sharply pointed, a little longer than diameter of eye; canthus angular, loreal region slightly depressed; nostril much nearer end of snout than eye; interorbital distance broader than an eyelid; tympanum distinct, about one-fourth the size of eye; fingers without web, first shorter and much slighter than second, third especially long and well developed; toes half webbed; toes with well-developed disks distinctly larger than tympanum; subarticular tubercles well developed; a slight inner metatarsal tubercle, tibiotarsal articulation reaching much beyond tip of snout; skin above smooth; below granulated; a light curved skin fold over eye to shoulder.

*Color.*—Above dark olive brown; a greenish white line from point of snout above nostrils, across edges of eyelids, over tympanum to side of body, there spreading as a large rhomboidal spot of lighter color; in middle of back the dark brown color of the back takes the shape of an hourglass; a large bright yellowish white spot on knee and elbow; legs above banded with darker brown; edges of lips dark brown with pure white spots; entire underside of body marbled with brown; neck brown, with light dots and a band across belly spotted and marbled with black.

*Measurements of Philautus schmackeri (Boettger).*

|                      | mm.  |
|----------------------|------|
| Total length of body | 18.5 |
| Length of head       | 8.5  |
| Width of head        | 8    |
| Diameter of eye      | 3.25 |
| Tympanum             | .75  |
| Foreleg              | 10   |
| Hind leg             | 37   |
| Femur                | 12.5 |
| Tibia                | 13   |
| Disk of fourth toe   | 1    |

*Remarks.*—The type specimen was collected on Mount Halcon, Mindoro. The name of the collector appears to be unknown. The type was presented to the Senckenberg Museum by B. Schmacker, of Shanghai, in 1889. It is for him that the

species was named. The species according to its author is characterized by the very long hind limbs and the very distinctive color and markings. The above description is taken from the type description.

**PHILAUTUS MINDORENSIS (Boulenger)**

*Ixalus mindorensis* BOULENGER, Ann. & Mag. Nat. Hist. VI 19 (1897) 107.

*Description of species.*—"Snout subacuminate, not projecting, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril slightly nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum distinct, one third to two fifths the diameter of the eye. Fingers free; toes one third webbed; disks as large as or a little smaller than the tympanum; a small inner metatarsal tubercle. Tibio-tarsal articulation reaching the nostril or the tip of the snout. Skin smooth above; throat and belly granulate.

*Color.*—"Grey above, sides paler, sometimes with a dark brown lumbar streak; temples, and sometimes the lores, dark brown; a white streak along the upper lip, or an oblique white streak below the eye; limbs with more or less distinct dark cross-bands; lower parts white, uniform or spotted or marbled with brown.

"From snout to vent 29 millim." (*Boulenger.*)

*Remarks.*—Several specimens from Mindoro (Mount Dulangan, 5,000 feet) are in the British Museum, collected by John Whitehead. I have seen no specimen of this species.

**PHILAUTUS LONGICRUS (Boulenger)**

*Ixalus longicrus* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 88.

*Description of species.*—"Snout pointed, as long as the diameter of the orbit; canthus rostralis angular; loreal region concave; nostril nearer the end of the snout than the eye; interorbital space broader than the upper eyelid; tympanum distinct, about two fifths the diameter of the eye. Fingers free, disks a little smaller than the tympanum; toes half-webbed. Tibio-tarsal articulation reaching far beyond the tip of the snout; femoro-tibial articulation reaching the shoulder. Above rough with small warts; two oblique glandular ridges, converging behind, between the shoulder[s]; throat smooth; belly and lower surface of thighs granulate.

*Color.*—"Grey above, with a large X-shaped dark marking or a pair of )(-shaped bands on the back, a dark cross band or triangular blotch between the eyes, and regular cross bands

on the limbs; a black light-edged spot on the knee; a streak below the canthus rostralis, a bar below the eye, and the whole temporal region blackish; dirty white beneath, throat finely speckled with brown; a series of small round white spots on the lower lip. Male with internal vocal sacs.

"From snout to vent 21 millim." (*Boulenger.*)

*Remarks.*—According to Boulenger the species is most closely related to *Philautus schmackeri* (Boettger). Three specimens were collected in Palawan by A. Everett.

I observed a specimen, which probably belonged to this species, in a mass of small plants just above a high waterfall in northern Palawan. I succeeded in getting the specimen but slipped while doing so. The ensuing fall liberated the specimen, which escaped by leaping over the waterfall.

#### PHILAUTUS ACUTIROSTRIS (Peters)

*Ixalus acutirostris* PETERS, Mon. Berl. Ak. (1867) 32; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 99; BOETTGER, Ber. Senck. Nat. Ges. (1886) 123; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 449.

*Description of species.*—(After Peters.) Snout pointed, canthus rostralis distinct; nostrils as far from each other as from end of snout; distance between nostrils contained in their distance from eye twice; tympanum very small, partly covered by skin; small granules upon the smooth skin of body as well as on eyelid; back part of the thigh and belly densely granulated; web on feet goes to the base of last joint on third and fifth toes.

*Color.*—Brown, and on the sides gray; small white dots present. Between the eyes an indistinct, brown, triangular spot, with a distinct spot near its posterior border; anterior and posterior side of thigh brown; below yellowish white.

#### *Measurements of Philautus acutirostris (Peters).*

|              | mm. |
|--------------|-----|
| Total length | 22  |
| Foreleg      | 15  |
| Hind leg     | 40  |

*Remarks.*—This species is known from two specimens, collected by Carl Semper in Mindanao.

#### PHILAUTUS BIMACULATUS (Peters)

*Leptomantis bimaculatus* PETERS, Mon. Berl. Ak. (1867) 32.

*Ixalus ? bimaculatus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 106.

*Description of species.*—(After Peters.) Male with vocal sac, the openings small, not far from corner of mouth; tongue forked

behind; snout scarcely longer than diameter of eye, with a distinct canthus rostralis, truncate in front; nostrils lateral, lying somewhat behind angle formed by the canthus rostralis and anterior end of snout; distance between nostrils is almost equal to their distance from eyes; tympanum small, the diameter about one-third diameter of eyes, and covered with skin; eyes very large, with pupil horizontal; body skin smooth; submental region with large granules; abdomen finely granulate; disks of fingers round, larger than toe disks; first finger placed opposite to the others, thickest at its base; second and third fingers one-third webbed; third and fourth half webbed; toes almost wholly webbed, reaching two-thirds of the distance on last joint of fourth toe; sole of foot smooth, a small projection covered with skin at its base; the insertion of sacral joint small.

*Color*.—Above violet-brown with unequal dark spots and transverse bands; a band between eyes; joints of limbs with darker transverse bands; under eye a characteristic, broadened, sharply truncate, yellowish white spot; a second, much smaller, immediately behind and under corner of mouth; below yellowish white.

*Measurements of Philautus bimaculatus (Peters).*

|              | mm. |
|--------------|-----|
| Total length | 34  |
| Head length  | 12  |
| Foreleg      | 25  |
| Hind leg     | 62  |

*Remarks*.—Two specimens, the types, from the upper Agusan Valley, Mindanao, are known.

PHILAUTUS MONTANUS Taylor

PLATE 3, FIG. 5

*Philautus montanus* TAYLOR, Philip. Journ. Sci. 16 (1920) 305.

*Type*.—No. 29, Bureau of Science collection; collected on Mount Bongao, Bongao, near south end of Tawitawi, at an elevation of about 700 meters, by E. H. Taylor.

*Description of type*.—Vomerine teeth wanting; choanæ large, prominent, separated from inner eye prominences by a distance equal to half their diameter; tongue elongate with a large V-shaped notch, making two rather long horns behind; head longer than broad, bluntly pointed; canthus rostralis rather rounded; diameter of eye equal to distance of eye from nostril; nostril two and one-half times farther from eye than from end of snout; loreal region sloping obliquely, slightly concave; diameter of tympanum a little more than one-half diameter of eye, separated from eye by a distance equal to one-third its diameter; interorbital region one and one-half times width of an upper

eyelid; skin smooth above, on head, back, and sides; chin smooth; posterior part of belly and thigh strongly granular; a slight supratemporal fold; arms short with a very narrow insertion; fingers broad, slightly webbed at base, with well-developed digital disks; disks equal to about two-thirds diameter of tympanum; first finger much shorter than second, its disk only slightly smaller than that of second; these two digits rather opposed to third and fourth; fourth finger reaches a little beyond base of disk of third; an indistinct skin fold on outer side of fourth digit, continued to elbow on outer side of arm; no inner web on arm; large nuptial excrescence on first finger; a well-defined kink at base of disks; toes two-thirds webbed, membranes reaching to base of toe disks only on outer side of second toe; fifth toe slightly longer than third, its disk reaching last subarticular tubercle on fourth toe; a very small, conical, inner metatarsal tubercle, about one-sixth the length of first toe; no outer tubercle; no fold on outer toe or along foot; subarticular tubercles well developed, not approaching disks in size; tibiotarsal articulation reaches tip of snout.

*Color in life.*—Above uniform, shiny, lavender-gray, with numerous very small, not clearly outlined, yellow spots; tip of snout darker than back; lores and upper lip gray, powdered with minute brown dots; a creamy yellow spot in front and somewhat below tympanum; latter light brown; irregular, distinct, dark spots from eye above arm and along sides, and areas of creamy yellow; belly dirty white to cream; chin with numerous small dusky spots; belly spotted; underside of limbs powdered with brown; anal region with a dark area, surrounded with a lighter yellow rim; arm and fingers with purplish brown bars; leg and foot barred with same color.

*Measurements of Philautus montanus Taylor.*

|                                 | mm.  |
|---------------------------------|------|
| Length, snout to vent           | 39   |
| Length of head                  | 15   |
| Width of head                   | 13.9 |
| Length of snout                 | 7    |
| Diameter of eye                 | 5.9  |
| Diameter of tympanum            | 3.2  |
| Depth of snout, in front of eye | 5    |
| Diameter of finger disk         | 2.5  |
| Foreleg                         | 26   |
| Hind leg                        | 65   |
| Longest finger                  | 11   |
| Femur                           | 22   |
| Tibia                           | 22   |
| Longest toe                     | 15   |

*Remarks.*—Only a single specimen was taken. It was found in a small pool of water, near the top of Bongao Peak, on the small island of the same name. No other specimen was seen. This species appears to be most closely related to *Philautus vittiger* Boulenger, from Java, and the differences are not great when compared with Boulenger's description. *P. montanus* is probably a larger species, and the markings are entirely different.

### Genus CORNUFER Tschudi

*Cornufer* TSCHUDI, Class. Batr. (1838) 28; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 616; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 84; COPE, Nat. Hist. Rev. (1865) 115; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 107; Ann. & Mag. Nat. Hist. IX 1 (1918) 373.

*Hylodes* DUMÉRIL, Ann. Soc. Nat. 19 (1853) 177.

*Halophila* GIRARD, Proc. Acad. Nat. Sci. Philadelphia 6 (1853) 423.

*Platymantis* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 93; BOULENGER, Ann. & Mag. Nat. Hist. IX 1 (1918) 373.\*

"Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth. Tympanum distinct. Fingers free; toes free or slightly webbed, the tips more or less dilated. Outer metatarsals united or separated by a groove. Omosternum and sternum with a bony style. Terminal phalanges T-shaped." (*Boulenger.*)

Polynesia, western Malayan region, and the Philippines.

#### *Key to the Philippine species of Cornufer Tschudi.*

a<sup>1</sup>. Tips of fingers dilated into large disks.

b<sup>1</sup>. Tongue with papilla; tibiotarsal articulation reaches nearly to tip of snout; with or without granules on belly.

*C. guentheri* Boulenger (p. 109).

b<sup>2</sup>. Tongue without papilla; tibiotarsal articulation reaches nostril; entire underside of body granular..... *C. worcesteri* Stejneger (p. 111).

a<sup>2</sup>. Tips of fingers with small disks, smaller than or equal to toe disks; tibiotarsal articulation reaches beyond snout.

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\* Boulenger has recognized Günther's genus *Platymantis* as a genus distinct from *Cornufer* Tschudi. In the latter genus he includes for the most part large-disked forms. He includes the four Philippine forms *C. guentheri*, *C. jagori*, *C. worcesteri*, and *C. corrugatus*, the latter probably through error since he also includes this species with *Platymantis*, together with *P. meyeri*. I have been unable to examine a specimen of *C. jagori*, but it is described as having small but distinct disks, probably similar to those of *C. corrugatus*. The new species described in this work, *C. laticeps*, would also be referred to this group.

With my present study of the group I do not regard the separation of these groups as warranted, and doubt greatly that the character of the disks alone is more of a generic character than are vomerine teeth, the character of the nostril, or the webbing of the feet. The character of the disks appears to be the only difference between the two genera.

*b*<sup>1</sup>. Tympanum two-thirds diameter of eye; first finger as long as second.

*C. meyeri* (Günther) (p. 112).

*b*<sup>2</sup>. Tympanum two-fifths diameter of eye; first finger shorter than second.

*C. jagori* (Peters) (p. 114).

*a*<sup>3</sup>. Tips of fingers with small disks; tibiotarsal articulation not reaching tip of snout.

*b*<sup>1</sup>. First finger longer than second; skin on back with distinct, regular, elongate, longitudinal folds; snout longer than eye.

*C. corrugatus* (Duméril) (p. 115).

*b*<sup>2</sup>. First finger longer than second; skin very rough with irregular folds; snout length equal to diameter of eye.... *C. laticeps* Taylor (p. 118).

#### CORNUFER GUENTHERI Boulenger

PLATE 8, FIGS. 1 AND 1a

*Cornufer guentheri* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 108, pl. 11, fig. 3; BOETTGER, Ber. Senck. Nat. Ges. (1886); CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 450.

*Description of species.*—(From No. 550, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, P. I., May, 1913, by E. H. Taylor.) Vomerine teeth in two short oblique series

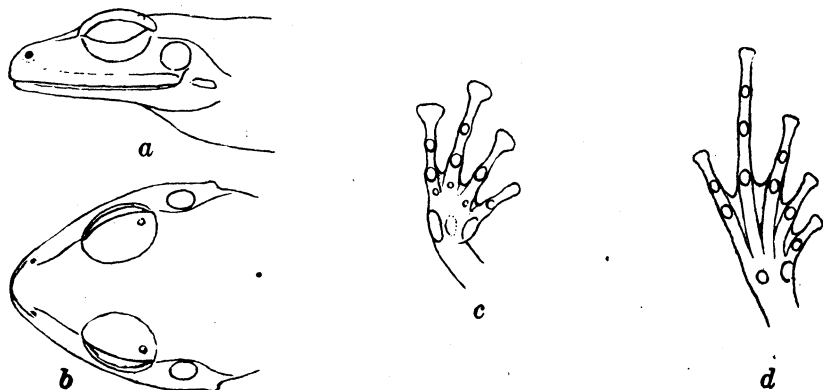


FIG. 3. *Cornufer guentheri* Boulenger; *a*, side of head; *b*, top of head; *c*, hand; *d*, foot;  $\times 2$ .

beginning on inner edge, but lying almost entirely behind posterior level of choanæ, separated from each other by a distance as great as, or greater than, the length of a single series; a distinct conical tubercle on anterior median part of tongue; head as long as broad or slightly longer; canthus rostralis distinct, slightly angular; loreal region sloping obliquely, somewhat concave behind nostril; diameter of eye slightly less than length of snout, reaching slightly beyond nostril; nostril one and one-third times farther from eye than tip of snout; tympanum small, circular, distinct, two-fifths to one-half diameter of eye, separated

from eye by a distance equal to three-fourths its diameter; inter-orbital region less than the width of a single eyelid; eyelids bounded above by slight grooves; a slight, shallow, longitudinal groove on snout, continued to between nostrils; skin of back smooth; sides somewhat granular, or with short longitudinal folds; a large conical tubercle on posterior part of upper eyelid, with a few smaller indistinct tubercles; a very slight, distinct supratemporal fold; skin of belly and chin smooth; posterior aspect of thighs strongly granular; fingers free, slender, with large transversely widened disks, except disk on first, which is very small, scarcely wider than balance of digit; first finger very short, reaching about halfway between subarticular tubercle and disk of second finger; second finger very slightly shorter than fourth, neither reaching base of disk of third; diameter of largest finger disks greater than tympanum; subarticular tubercles large, rather flattened; toes slightly webbed at base, the membranes not reaching much beyond first subarticular tubercles; toes with small disks, very much smaller than finger disks; an elongate, oval, inner metatarsal tubercle, and a small, round, outer tubercle; third toe longer than fifth; tibiotarsal articulation reaches between eye and nostril.

*Measurements of Cornufer guentheri Boulenger.*

|                         | mm.  | mm.  |
|-------------------------|------|------|
| Length, snout to vent   | 35   | 36.5 |
| Length of head          | 15   | 15   |
| Width of head           | 14.2 | 14.1 |
| Length of snout         | 6.1  | 6.2  |
| Diameter of eye         | 5.9  | 6    |
| Diameter of tympanum    | 2.4  | 2.5  |
| Diameter of finger disk | 2.2  | 2.2  |
| Foreleg                 | 23   | 22   |
| Longest finger          | 10   | 10   |
| Hind leg                | 54   | 58   |
| Longest toe             | 15   | 15.5 |
| Tibia                   | 17   | 18   |

*Variation.*—A second specimen, whose measurements are given in the second column, was taken in a nearby locality; it differs from the first in having a rather broad yellowish-white line from point of snout to anus, balance of back cinnamon brown, snout and lores slightly granular. The dark spots on head are dim brownish; the tympanum is slightly larger, and the hind leg slightly longer, proportionally. They both differ from the type in having the entire under surface, except thigh, smooth instead of granular.

*Remarks.*—Both specimens are from Bunawan. They were found under loose bark, at the bases of large forest trees away from the immediate vicinity of water. No other specimen was observed. The type is from Dinagat Island and was collected by A. Everett. The specimen here described differs slightly from the type; in the type the tympanum equals half the diameter of the eye, and the tibiotarsal articulation reaches near to tip of snout. The skin above has granular folds in the type which are apparently absent in our specimen, save on the sides. The coloration and markings are obviously variable.

This species is similar to *Cornufer worcesteri* Stejneger, from which it differs in the following manner: Tongue without papilla; interorbital region somewhat wider, and entire underside of body granular. The last two characters are variable in many species; and, were it not for the absence of the papilla on tongue, I should be inclined to regard *C. worcesteri* as being identical with *C. guentheri*. Since the two species were founded on single specimens (Stejneger's in an admittedly indifferent state of preservation), larger collections may prove that they are the same species. My two specimens, which also differ somewhat from Boulenger's description as well as from each other, have distinct papillæ, but that of No. 551 is less distinct than in the described specimen.

#### CORNUFER WORCESTERI Stejneger

*Cornufer worcesteri* STEJNEGER, Proc. U. S. Nat. Mus. 28 (1905) 345.

*Description of type.*—"Vomerine teeth in two oblique series behind the level of the hinder edge of the choanæ; orbital diameter slightly less than distance of orbit from tip of snout; interorbital space considerably wider than upper eyelid; canthus rostralis rounded; lores concave; crown flat; tympanum nearly circular, about one-half the diameter of the eye; fingers free, first considerably shorter than second, which is shorter than fourth; disks rather large; toes webbed at the base; disks well developed, though not quite so large as on the fingers; hind limb being carried forward, the tibiotarsal joint does not reach the tip of the snout, only to about the nostrils; skin smooth above, (possibly with some longitudinal folds, but that cannot be decided on account of the state of the specimen) coarsely granular on the whole underside, including the throat; a distinct tubercle on the upper eyelid.

*Color.*—"Above pale brownish gray with small, irregular, dark brownish spots; snout decidedly brownish; a very distinct blackish brown band across the top of the head at the anterior end of

the upper eyelids, involving them and continuing below the eye to the edge of the lip; tympanic region dark, but loreal region pale brown as the snout and without dark stripe; underside pale, finely dusted over with brownish; limbs with traces of dark cross bars." (*Stejneger*.)

*Measurements of Cornufer worcesteri Stejneger.*

|   | mm. |
|---|-----|
| Total length  | 28  |
| Width of head                                       | 12  |
| Length of foreleg                                   | 17  |
| Length of hind leg, from vent to tip of longest toe | 45  |

*Remarks.*—The type specimen is in an indifferent state of preservation. According to *Stejneger* the species is most closely related to *Cornufer jagori* (Peters), from Samar. The toe and finger disks are larger. The coloration seems to be distinctive, especially the frontal crossband.

CORNUFER MEYERI (Günther)

PLATE 8, FIG. 3

*Platymantis meyeri* GÜNTHER, Proc. Zool. Soc. London (1873) 171.

*Cornufer meyeri* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 109, pl. 11, fig. 4; BOETTGER, Ber. Senck. Nat. Ges. (1886) 124; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 450.

*Description of species.*—(From No. 69, Bureau of Science collection. Taken from the belly of a specimen of *Boiga dendrophila* from Luzon.) Vomerine teeth in two slightly oblique groups, lying almost wholly behind the posterior level of choanæ, the series rather short, somewhat rounded, separated from each other by a distance greater than the length of a single series; tongue broad, notched behind, with a large well-developed papilla on anterior median line; head much longer than wide; canthus rostralis only slightly angular; loreal region strongly concave; interorbital space slightly less than width of upper eyelid; diameter of eye a little less than length of snout; nostrils as far from each other as their distance from eye; nostril little more than one and one-half times as far from eye as from end of snout; diameter of tympanum from one-half to two-thirds of eye; tympanum separated from eye by a distance greater than half its diameter; skin with short glandular folds, irregularly placed on body; a distinct supratemporal fold from eye to shoulder; limbs rather granular or with small folds; belly, chin, and underside of thighs perfectly smooth; posterior aspect of thighs and anal region granular; fingers long, slender, the first equal in length to the second; fourth extending slightly farther than first or second, all three reaching beyond first subarticular tuber-

cle of third; disks small, slightly wider than digits; subarticular tubercles large, well developed, the middle one larger than the finger disks; carpal tubercles large, those on inner finger largest, those on middle finger second in size; no webs; no skin fold on

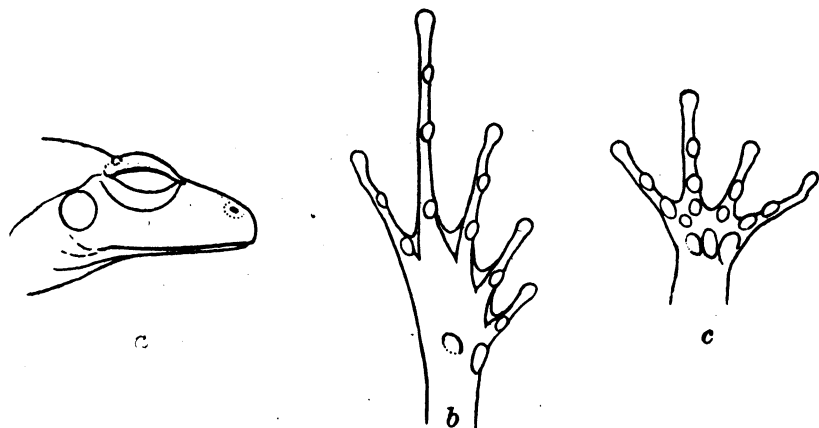


FIG. 4. *Cornufer meyeri* (Günther); a, side of head; b, foot; c, hand;  $\times 2$ .

outer side of fingers; toes long, slender, with a rudiment of web which does not reach beyond base of lower subarticular tubercles; disks distinctly wider than those on fingers; third toe longer than fifth; fifth reaching slightly beyond second subarticular tubercle of fourth toe; metatarsal tubercles strongly developed, but small; an outer round, and inner oval, tubercle less than one-third length of first toe; tibiotarsal articulation carried forward reaches beyond tip of snout.

*Measurements of Cornufer meyeri* (Günther).

[The second measurements recorded are also from a Luzon specimen.]

|                                 | mm.  | mm.  |
|---------------------------------|------|------|
| Length, snout to vent           | 41   | 38.4 |
| Length of head                  | 16.5 | 15   |
| Width of head                   | 14.5 | 14.5 |
| Length of snout                 | 7    | 6.5  |
| Diameter of eye                 | 6    | 5.9  |
| Diameter of tympanum            | 3.5  | 3.5  |
| Depth of snout, in front of eye | 5    | 4.5  |
| Foreleg                         | 29   | 27.5 |
| Longest finger                  | 11.4 | 11   |
| Hind leg                        | 80   | 76   |
| Tibia                           | 24   | 23   |
| Femur                           | 19   | 19   |
| Longest toe                     | 23   | 22   |
| Heel and foot                   | 35.5 | 32.5 |
| Diameter of toe disk            | 1.5  | 1.5  |

*Color in alcohol.*—Above brownish slate, not uniform, with two distinct dorsolateral light lines from on eyelids to near end of body; upper part of arm whitish; subarticular tubercles of hands light; posterior part of thighs reddish brown; limbs bluish to grayish slate, femur with a few indistinct bars of darker color; tubercles of feet gray; belly dirty white, reticulated with dusky; indistinct spots on lips.

*Variation.*—There are many specimens of this species from Mindoro, Lubang, Luzon, and Negros in the collections studied. They agree fairly well in proportions, but the specimen here described is larger than any other in the collection. The specimens from Negros appear to have a deeper head and body than do those from Luzon and Mindoro. Practically no two specimens can be found with the same color patterns. Some are deeply reticulated with brown below, others uniformly light with no markings; some show a certain regularity in the arrangement of the longitudinal folds on the shoulders; a few from various localities have narrow median lines on the body, and others are marked with two lateral lines; others are uniformly colored above. Obviously, color markings are very unreliable characters in this group of frogs.

*Remarks.*—This species appears to be common in the localities named. The frogs are usually found moving about in the forest, away from the immediate vicinity of water. The type, collected by A. B. Meyer, is from "Laguna de Bay." Specimens are reported by Boettger from Mindoro and Leyte. Apparently it is strictly a Philippine species.

#### CORNUFER JAGORI (Peters)

*Halophila Jagorii* PETERS, Mon. Berl. Ak. (1863) 456.

*Cornufer jagori* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 109; BOETTGER, Ber. Senck. Nat. Ges. (1886) 124.

*Description of species.*—(From the type description.) Vomerine teeth in two oblique series, lying between and behind posterior level of choanæ; choanæ small; tongue heart-shaped, with two points behind; diameter of eye almost equal to length of snout; tympanum roundish, about two-fifths diameter of eye; body with granules and distinct longitudinal folds; arm reaches back end of body; fingers entirely free, with small but distinct digital disks; first finger a little shorter than second and scarcely longer than fourth, third longest; two distinct longitudinal carpal tubercles; subarticular tubercles strongly defined; hind leg carried forward tibiotarsal articulation reaches beyond snout by one-third the length of tibia; disks of toes distinct; small web

between base of toes; two metatarsal tubercles; subarticular tubercles of toes distinct; fifth toe shorter than third.

*Color*.—Body above dark brown; below whitish with dark brown, strongly defined on neck; lips and limbs with dark spots.

*Measurements of Cornufer jagori (Peters).*

|                                   | mm.  |
|-----------------------------------|------|
| Total length                      | 18.5 |
| Length of head                    | 8    |
| Width of head                     | 6    |
| Foreleg                           | 13   |
| Length of hand, with third finger | 5.5  |
| Hind leg                          | 35   |
| Length of foot and fourth toe     | 16   |

*Remarks*.—I have been unable to obtain a specimen of this species. Peters does not mention the presence of a lingual papilla, and it probably does not occur. It would be well, however, to have the type examined to determine this point. It is probable that the type is immature; it is said to be not very well preserved. The type locality is "Insel Samar." The type was discovered by F. Jagor.

CORNUFER CORRUGATUS (Duméril)

PLATE 4, FIGS. 3, 3a, AND 3b

*Hylodes corrugatus* DUMÉRIL, Ann. Sci. Nat. III 19 (1853) 176.

*Platymantis plicifera* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 95, pl. 8, fig. 3; Proc. Zool. Soc. London (1877) 132.

*Platymantis corrugata* PETERS, Mon. Berl. Ak. (1873) 611; PETERS and DORIA, Ann. Mus. Civ. Gén. 13 420.

*Cornufer corrugatus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 110; BOETTGER, Ber. Senck. Nat. Ges. (1886) 123; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 450; MÉHELY, Termes, Fuzetek 20 (1897) 411, pl. 10, fig. 142; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 70; VAN DAMPEN, Nova Guinea 5 (1906) 167.

*Description of species*.—(From No. 200, E. H. Taylor collection; collected on Mount Maquiling, near Los Baños, Laguna, P. I., May, 1916, by E. H. Taylor.) Vomerine teeth in two short, oblique groups, somewhat rounded, lying for the most part behind the level of the choanæ; tongue large, oval, not deeply notched behind, the horns rather widely separated at base; a distinct enlarged papilla on tongue; choanæ rather large; head pointed, as wide as long or a little wider, canthus rostralis present, slightly rounded, the edges converging to tip of snout, where they just fail to make an angle; eyes prominent, their diameter less than length of snout, but reaching beyond nostril; distance of nostrils from each other equals their distance from eye; nos-

trils one and a half times as far from eye as from end of snout; neither snout nor forehead concave; lores sloping gently, not or scarcely concave; interorbital area equal to, or a little less than, a single eyelid; anterior outline of head unbroken by eye, when viewed from above; tympanum equals about two-thirds eye, its outline rather indistinct on upper posterior part; skin of head

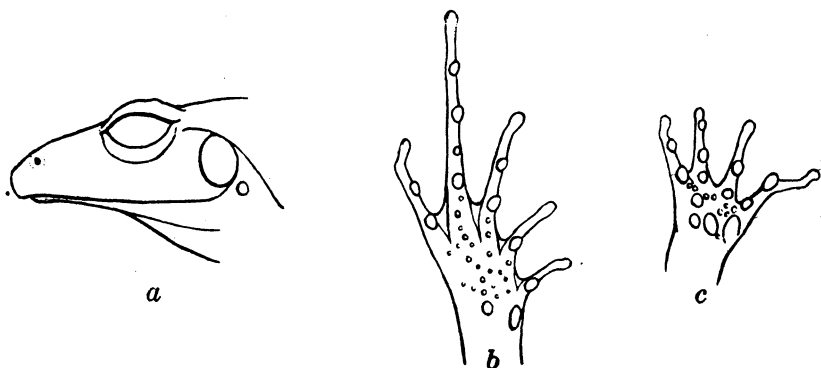


FIG. 5. *Cornufer corrugatus* (Duméril); a, side of head; b, foot; c, hand;  $\times 2$ .

smooth, granular above eyes; skin on back arranged in rather regular, elongate, symmetrical folds, with shorter folds and scattered tubercles; sides granular; rather prominent tubercles behind and below tympanum; upper part of limbs with more or less distinct rows of granules; belly and posterior aspect of thighs strongly granular; chin and underside of foot dimly granular; a strong supratemporal fold to arm; fingers short, first longer than second and fourth but a little shorter than third, second and fourth subequal; disks very small, smaller than the largest subarticular tubercles; subarticular tubercles on palm large, distinct; digits quite free; toes slender, with a rudiment of web; disks small, about equal to subarticular tubercles; an oval inner metatarsal tubercle and a conical outer tubercle; point of tibio-tarsal articulation granular; when brought forward it reaches between eye and nostril, but nearer the latter; male with two internal vocal sacs.

*Color in life.*—Above reddish brown, with darker regular spots in middle of back; a dark interorbital spot covering part of eyelids; snout light yellow-brown, lighter on canthus; below canthus dark, growing slightly lighter on lip; tympanum brown, with a black area covering upper part, and an area behind, below supratympanic fold; arms and legs barred with brown, with a few distinct black spots on thigh near knee and just

above heel; a dark stripe on tarsus and sole strongly contrasted with the lighter color above foot; below cream, posterior aspect of thighs brownish; darker about anus.

*Measurements of Cornufer corrugatus (Duméril).*

|                                | mm.  |
|--------------------------------|------|
| Length, snout to vent          | 41   |
| Length of head                 | 19   |
| Width of head                  | 19   |
| Diameter of eye                | 5.5  |
| Diameter of tympanum           | 3.5  |
| Length of snout                | 7.3  |
| Depth of head, in front of eye | 5    |
| Foreleg                        | 26.5 |
| Longest finger                 | 11   |
| Hind leg                       | 76   |
| Tibia                          | 24.5 |
| Femur                          | 22   |
| Longest toe                    | 21   |
| Diameter of disk               | 1    |

*Variation.*—This species, which appears to be distributed over the entire eastern part of the Philippine Archipelago, exhibits considerable variation. The characters that appear invariable are that the first finger is longer than the second, and the tibio-tarsal articulation fails to reach tip of snout. The longitudinal folds on the back are usually regular, assuming the same general outlines. However, there are two specimens from Los Baños, Laguna, Luzon, which approach *Cornufer meyeri* (from the same locality) in coloration; the arrangement of the lines on the back differs from the typical *C. corrugatus* in that they are short and, apparently, do not conform to any regular pattern; the lips, both upper and lower, are strongly spotted with black; the lores are black and there is a distinct temporal black spot limited by the supratemporal fold; the spots on the inner sides of limbs are very distinct; there are distinct spots of black on shoulders; a dark stripe is present on heel and foot. Another small specimen from the same locality is identical with the above in color and markings.

Some specimens from Negros and Mindanao, when first taken, were almost uniform flesh pink on the back, with bright carmine spots on the posterior part of thighs and tibia and on the anterior part of femur and about groin. The Mindanao specimens were darkest, and those in the collection from Negros, lightest. There are specimens in my collection from Luzon, Mindanao, and Negros. Boettger reports the species from Tablas. Outside the

Philippines, it is known in Ceram, New Guinea, the Kei Islands, the Bismarck Islands, and Halmaheira. I believe it has not been taken in Borneo.

CORNUFER LATICEPS Taylor

PLATE 3, FIG. 1

*Cornufer laticeps* TAYLOR, Philip. Journ. Sci. 16 (1920) 317.

*Type*.—No. 197, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, September, 1912, by E. H. Taylor.

*Description of type*.—Vomerine teeth in two short, somewhat rounded series, lying for the most part behind hinder level of choanæ, but arising from their inner posterior edge; tongue nearly as wide as long, with two small, rounded, posterior horns, separated at base; a large papilla on anterior median part; head a little longer than broad; canthus rostralis rounded; lores sloping slightly at top, then very obliquely over lip to mouth, concave behind nostril; eye large, its diameter as long as snout or slightly shorter; nostril twice as far from eye as from end of snout; width of interorbital region equal to about one-half width of a single eyelid; tympanum small, its posterior border not distinct, vertically oval, little more than one-third diameter of eye; skin rough, granular, and tubercular; prominent tubercles on lores, snout, eyelids, sides, and back; a few short longitudinal skin folds on dorsolateral region; a strong supratemporal fold partially covering tympanum; skin of chin smooth; belly smooth except on posterior part, which is granular; underside of thighs smooth, posterior aspect granular; first finger longer than second and equal to fourth; no trace of webs; disks scarcely wider than digits, not larger than subarticular tubercles; no humeral fold or skin fold on outer side of fourth finger; toes with mere rudiment of web; disks on toes larger than those on fingers; subarticular tubercles prominent, conical; third toe extends farther than fifth; fourth very long; a longitudinally oval, inner metatarsal tubercle, and a rounded outer which is smaller; no tarsal fold; no skin fold on outer side of toes; greatest width of body immediately posterior to tympanum; entire outline of head not broken by eye when viewed from above; tibiotarsal articulation reaching to near nostril.

*Color in life*.—Above brown, mottled and spotted with darker brown; somewhat lighter longitudinal areas on either side of back, and another between eyes followed by a darker area; snout darker; lips barred with lighter and darker bars; a dark brown temporal area; sides lighter than back, spotted with brown; foreleg strongly barred with brown; third and fourth

fingers barred with brown; hind legs cinnamon brown with darker bars; toes barred with darker and lighter brown; belly creamy white; chin dusky.

*Measurements of Cornufer laticeps Taylor. Type and two cotypes.*

|                             | Type. | Cotype. | Cotype. |
|-----------------------------|-------|---------|---------|
|                             | mm.   | mm.     | mm.     |
| Length. snout to vent ..... | 49    | 40      | 40      |
| Length of head .....        | 22    | 17.5    | 17.5    |
| Width of head .....         | 20.2  | 17.5    | 17.5    |
| Width of upper eyelid ..... | 6.5   | 5.5     | 5.2     |
| Diameter of eye .....       | 7.5   | 6       | 6.2     |
| Length of snout .....       | 7.9   | 6.8     | 7.5     |
| Diameter of tympanum .....  | 3     | 3       | 3.2     |
| Foreleg .....               | 29    | 24      | 24      |
| Longest finger .....        | 12.2  | 10.3    | 10      |
| Hind leg .....              | 81    | 71      | 70.5    |
| Femur .....                 | 25    | 21      | 21.5    |
| Tibia .....                 | 27    | 23      | 22      |
| Longest toe .....           | 25.5  | 20.5    | 21      |

*Variation.*—The listed measurements record the chief proportional differences which occur in three specimens. Three other specimens in the collection are of the same size as the two smaller specimens whose measurements are given. In color and markings they vary but little.

This species is related to *Cornufer jagori* (Peters), from Samar, and possibly also to *C. vitianus* Duméril, of the Fiji Islands. From *Cornufer jagori* it appears to differ in having shorter hind legs, the tibiotarsal articulation reaching about to nostril instead of beyond snout, the first finger being distinctly longer than second, the lingual papilla being present, in being much larger in size, and in having greater ruggedness of skin and width of head.

Specimens were collected in the immediate vicinity of water, at low elevations, usually under leaves or logs along the edges of small mountain streams. Many other specimens taken were lost in shipment. Not rare at Bunawan.

#### BREVICIPITIDÆ \*

No maxillary teeth; diapophyses of sacral vertebra dilated; sternal structure variable. Distal phalanges simple or T-shaped; pupil erect or horizontal. Vertebra procelian, without ribs.

\* Stejneger has shown [Proc. Biol. Soc. Washington 23 (1910) 165] that the name Brevicipitidæ must take preference over Engystomidæ, by which name this family has long been known.

This family shows very marked variation in numerous skeletal characters, especially in the sternum, and in the articulation of the coccyx. In the Philippines five genera have been recognized, containing in all eight species.

*Key to the Philippine genera of the Brevicipitidæ*

- a<sup>1</sup>. Pupil erect; no precoracoids; tympanum hidden.
  - b<sup>1</sup>. Tongue elliptic; a cutaneous ridge across palate between choanæ and another in front of œsophagus; fingers free, toes more or less webbed..... *Microhyla* Tschudi (p. 121).
  - b<sup>2</sup>. Tongue oblong; palatine bones forming a bony ridge (sometimes toothed) across palate; two cutaneous ridges across palate in front of œsophagus..... *Kaloula* Gray (p. 122).
- a<sup>2</sup>. Pupil horizontal; precoracoids present; no vomerine teeth.
  - b<sup>1</sup>. Tongue oval; a dermal ridge across palate, between and in front of Eustachian tubes; fingers free, toes partly webbed; tympanum distinct..... *Kalophrynus* Tschudi (p. 129).
  - b<sup>2</sup>. Tongue elliptical; a very indistinct bony ridge may be present behind choanæ; dermal fold in front of œsophagus; tympanum sometimes wanting; fingers and toes entirely free.
    - Chaperina Mocquard (p. 133).
  - b<sup>3</sup>. Tongue large, rounded, a doubly arched palatal ridge present or absent; a smooth dermal ridge in front of Eustachian tubes, and another behind them; tympanum present; fingers and toes free; no subarticular tubercles..... *Phrynixalus* Boettger (p. 137).

For the most part these small toads are terrestrial and burrowing, although one species, *Kaloula conjuncta*, ascends trees and probably makes them a more or less permanent habitat. Several of the species live exclusively on ants. Many of the species exude from their skin a poisonous substance which protects them from being eaten by their enemies.

Several specimens of *Kaloula picta* were placed in a cobra cage, and four of them were eaten by a young female cobra. After finishing the meal she rubbed her head about the cage, seemed extremely restless, frothed at the mouth, and appeared to be in pain. Later two other frogs were seized, partially swallowed and then ejected. When other food, such as a medium-sized *Rana*, was available, the *Kaloula* were not touched by the cobras. A dog will sometimes pick up one of these small toads in his mouth, but immediately eject it in great disgust.

The male *Kaloula conjuncta*, when clasping the female, becomes glued to her back by excretion, either from her back or from his belly. This fact was noted also in *Kalophrynus stellatus*.\*

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\* It is significant that this species is eaten by the Benguets, Kalingas, Ifugaos, and Bontocs. The common names for the species are: *Gá-co* (Benguet), *tók-tók* (Bontoc and Kalinga), *ták-ták* (Ifugao).

Genus **MICROHYLA** Tschudi \*

- Microhyla* TSCHUDI, Class. Batr. (1838) 71; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 163; Fauna Brit. India, Rept. (1890) 491.
- Microhyla* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 613; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 121.
- Hylaplesia* FITZINGER, Syst. Rept. (1843) 31.
- Siphneus* FITZINGER, Syst. Rept. (1843) 33.
- Dendromanes* GISTEL, Naturg. Thierr. (1848) 11.
- Diplopelma* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 50.
- Scaptophryne* FITZINGER, Sitz. Ber. Ak. Wien 42 (1861) 146.

Pupil vertical; tongue elliptical, entire, free behind; a more or less distinct cutaneous ridge across palate between choanæ, and another in front of œsophagus; tympanum hidden; fingers free; toes more or less webbed, sometimes very slightly; tips of fingers and toes blunt or more or less dilated; outer metatarsals united; no precoracoids; no omosternum; sternum cartilaginous; diapophyses of sacral vertebra moderately dilated; terminal phalanges simple. India, China, Japan, and East Indies.

*Remarks.*—One species has been reported from the Philippines, on the doubtful authority of J. G. Fischer.† I have included the species because of the possibility of its occurrence. It is noteworthy that the genus *Microhyla* is the only representative of the Brevicipitidæ found in Formosa and the islands to the north.‡ One species is confined to Formosa; a second inhabits the islands between Formosa and Japan proper.

**MICROHYLA ACHATINA** (Bole)

- Hylaplesia achatina* BOIE, Isis (1827) 294.
- Microhyla achatina* TSCHUDI, Class. Batr. (1838) 71; PETERS and DORIA Ann. Mus. Gen. 13 428; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 166; BOETTGER, Ber. Senck. Nat. Ges. (1886) 124; FISCHER, Jahrb. Wiss. Anst. Hamburg 2 (1885) 80; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 450; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 71, pl. 7, fig. 27.
- Microhyla achatina* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 614; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 121.

*Description of species.*—"Habit slender. Snout subacuminate, longer than the orbital diameter; interorbital space broader than

\* Of doubtful occurrence in the Philippine Islands.

† Jahrb. Wiss. Anst. Hamburg 2 (1885) 80.

‡ In a recent letter M. Lazo, who is making a herpetological collection in the Batan Islands for the Bureau of Science, says that no batrachians of any sort are to be found there. This statement may be questioned and is remarkable if true. The Batan Islands lie between Formosa and Luzon.

the upper eyelid. Fingers rather slender, first much shorter than second; toes slender, webbed at the base; tips of fingers swollen into very small, of toes into well-developed disks; sub-articular tubercles distinct; two small metatarsal tubercles. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the tip of the snout, or beyond. Skin smooth.

*Color*.—"Brown above; sides and a streak between the eyes dark brown; sometimes the back with rather indistinct chevron-shaped darker and lighter lines and a narrow light vertebral line; limbs more or less distinctly cross-barred; anal region blackish." (*Boulenger*.)

*Remarks*.—This species is included here on the strength of Fischer's report, but not without some doubt. His specimen was presumably from southern Mindanao. The species is known from the Malay Peninsula, Sumatra, Nias, and Java. Barbour's specimen from Java was taken at an altitude of about 1,520 meters. The fact that no more specimens have been found in the Philippines may be due to the paucity of collections from high mountains.

#### Genus **KALOULA** Gray

*Kaloula* GRAY, Zool. Misc. (1831) 38; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 122.

*Hylaedactylus* TSCHUDI, Class. Batr. (1838) 85; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 732.

*Plectropus* DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 736.

*Holonectes* PETERS, Mon. Berl. Ak. (1863) 455.

*Calohyla* PETERS, Mon. Berl. Ak. (1863) 455.

*Callula* GÜNTHER, Rept. Brit. India (1864) 436; COPE, Journ. Acad. Nat. Sci. Philadelphia II 6 (1867) 192; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 167; Fauna Brit. India, Rept. (1890) 493.

"Pupil erect. Tongue oblong, entire and free behind. Vomerine teeth none; palatine bone forming an acute, sometimes toothed ridge across the palate. Two cutaneous, more or less distinctly denticulated ridges across the palate, in front of the oesophagus. Tympanum hidden. Fingers free; toes more or less webbed, exceptionally free, the tips more or less dilated. Outer metatarsals united. No precoracoids; no omosternum; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated. Terminal phalanges triangular or T-shaped. East Indies." (*Boulenger*.)

#### *Key to the Philippine species of Kaloula Gray.*

a<sup>1</sup>. Toes slightly webbed at base; digits dilated, especially fingers; a blunt inner metatarsal tubercle..... *K. baleata* (Müller) (p. 125).

*a*<sup>1</sup>. Toes one-third webbed, or more.

*b*<sup>1</sup>. Tips of fingers very small; inner metatarsal tubercle very large, compressed..... *K. picta* (Bibron) (p. 123).

*b*<sup>2</sup>. Tips of fingers with very large disks; inner metatarsal tubercle moderately large..... *K. conjuncta* (Peters) (p. 126).

#### KALOULA PICTA (Bibron)

##### PLATE 9, FIG. 4

*Plectropus pictus* BIBRON, in Eydoux and Souleyet, Voy. Bonite, Rept. pl. 9, fig. 2; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 737; STEINDACHNER, Verh. Zool. Bot. Ges. Wien 14 (1864) 257.

*Kaloula picta* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 123, part.

*Callula picta* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 168;

CASTO DE ELERA, Cat. Fauna Filipinas 1 (1896) 451.

*Description of species.*—(Described from sixteen males and seventeen females; collected July 11, 1917, in a small pool near an electric light on a street of Manila, by E. H. Taylor.) Palatal

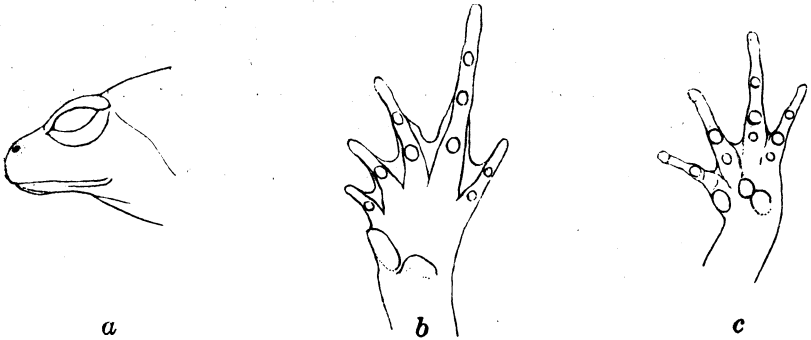


FIG. 6. *Kaloula picta* (Bibron); *a*, side of head; *b*, foot; *c*, hand;  $\times 2$ .

bones forming two transverse ridges across ridge of mouth immediately behind choanæ, curved backward on inner ends; snout very short and obtusely rounded, canthus rostralis rounded and not prominent; loreal region sloping very obliquely, not or very slightly concave; eye large, the supraocular region prominent; diameter of eye equals distance from eye to apex of snout; distance between nostrils greater than their distance from eye; nostrils halfway between eye and tip of snout; skin of back smooth or granular; granules when present scattered, or sometimes in indistinct longitudinal rows; a minute median dorsal fold sometimes present; granules numerous on posterior aspect of thigh; skin of belly slightly wrinkled, sometimes granular posteriorly; tympanum not or scarcely visible; a distinct fold from corner of eye to in front of foreleg; legs strong, hind legs (tip of toe to anus) longer than distance from snout to anus;

fingers free, first much shorter than second, latter nearly same length as fourth; tips of fingers and toes not dilated into disks; subarticular tubercles well developed; toes about one-third webbed, very large; an inner metatarsal tubercle longer than first toe, outer metatarsal tubercle much smaller, prominent, their edges rather sharp and hard; tarsus without fold; males with simple vocal sac which opens by a pair of slits at side of tongue; underside of chin of males with two or three large folds of skin; a slight fold frequently evident across head behind eyes; tongue free and entire behind; pupil vertical; the tibio-tarsal articulation reaches eye.

*Color in life.*—The specimens vary in color from a dull muddy drab to dull red, through varying shades of olive and olive brown. Back with a large irregular blotch of darker color, frequently resembling the silhouette of a man standing upright with two horns on his head; dark laterally, becoming lighter on belly; belly rather light, covered with brownish reticulations, numerous on chin; legs and arms barred with darker; in the breeding males the throat is a dark yellow green, and a wash of greenish color on forelegs is sometimes present; in alcohol the green on throat becomes slate colored.

*Measurements of Kaloula picta (Bibron).*

|                         | mm.  |
|-------------------------|------|
| Length, snout to vent   | 43   |
| Length of head          | 12   |
| Width of head           | 13.5 |
| Diameter of eye         | 4.6  |
| Length of snout         | 4.6  |
| Width of body, greatest | 25   |
| Foreleg                 | 26.5 |
| Longest finger          | 12   |
| Hind leg                | 56   |
| Tibia                   | 15   |
| Longest toe             | 19   |

*Variation.*—The males and females before me may be easily distinguished by the green color on chin of the former. The females are larger and for the most part are heavy with eggs. The skin on chin and throat of the males is stretched and is plicate, or with a single large fold, due to the expansion of the vocal sacs during the breeding season.

*Remarks.*—There can be no doubt as to the distinctness of the two species, *Kaloula picta* and *K. conjuncta*. None of the specimens at hand, male or female, of the former species has the ends of the digits dilated. During the breeding season these frogs are incredibly common about Manila, even on the streets;

they may be taken in quantity at this time, after which they disappear and are very rarely found. They seem to be wholly terrestrial or subterrestrial. The species is known in Luzon, Negros, and Mindoro. Three specimens in my collection, presented to me by W. Schultze, are said to be from Dumaran Island, near Palawan. This locality I believe doubtful.

#### KALOULA BALEATA (Müller)

*Bombinator baleatus* MÜLLER, Verhandel. Batav. Genootsch. (1836) 96.

*Hylaedactylus baleatus* TSCHUDI, Class. Batr. (1838) 85; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 734.

*Kaloula baleata* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 122; STEINDACHNER, Novara, Amph., 68; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 72.

*Callula baleata* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed: 2 (1882) 169; BOETTGER, Ber. Senck. Nat. Ges. (1886) 124; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 451.

*Description of species.*—"Snout short, rounded, as long as the orbital diameter; interorbital space broader than the upper eyelid. Fingers moderate, the tips strongly dilated, truncated; first finger shorter than second; toes rather short, webbed at the base, tips

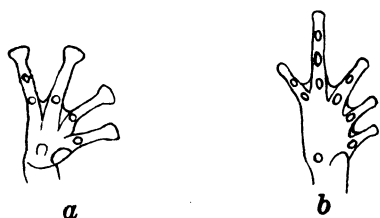


FIG. 7. *Kaloula baleata* (Müller); after Boulenger; a, hand; b, foot.

swollen into small disks; subarticular tubercles distinct; metatarsal tubercles two, oval, inner large, compressed, with blunt edge. The hind limb being carried forwards along the body, the tarso-metatarsal articulation reaches between the shoulder and the eye. Skin smooth, or

with small flat warts on the upper surfaces; a fold from the eye to the shoulder, and another, more or less indistinct, across the head behind the eyes. Male with a subgular vocal sac.

*Color.*—"Brown, olive, or blackish above, uniform or variegated with darker; frequently large whitish spots on the arm-pits, on the loins, and on the limbs; beneath brown, variegated with whitish." (*Boulenger.*)

*Remarks.*—This species is known from Java, Celebes, and the Philippine Islands. Two specimens in the British Museum were collected by Dr. A. B. Meyer, at Laguna de Bay. It is noted that Meyer also collected this species in Celebes and that specimens from that locality also are in the British Museum. As the species has not been rediscovered in the Philippines, I rather suspect that a change of labels has occurred, and that the so-called Philippine specimens are in reality from Celebes.

## KALOULA CONJUNCTA (Peters)

PLATE 9, FIG. 1

*Hylaedactylus (Holonectes) conjunctus* PETERS, Mon. Berl. Ak. (1863) 455.

*Kaloula picta* (B. female) GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 123, part.

*Hylaedactylus conjunctus* STEINDACHNER, Vehr. Zool. Bot. Ges. Wien 14 (1864) 256, pl. 11, fig. 5.

*Callula conjuncta* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 168; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel. Mus. (1883) 4; COPE, Journ. Acad. Nat. Sci. Philadelphia II 6 (1867) 192; BOETTGER, Ber. Senck. Nat. Ges. (1886) 124; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 451.

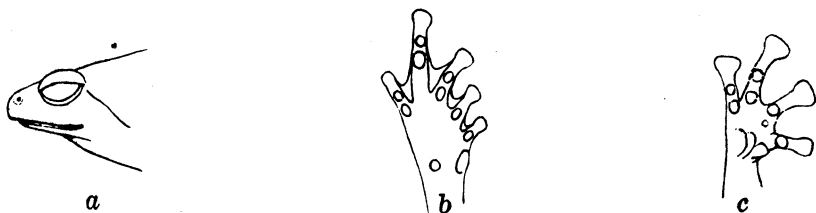


FIG. 8. *Kaloula conjuncta* (Peters); a, side of head; b, foot; c, hand;  $\times 1$ .

*Description of species*.—(From No. 798, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, P. I., July 10, 1912, by E. H. Taylor.) No vomerine teeth; choanæ large, transversely elongate, distance between them only a little more than half distance between nostrils; beginning on posterior outer edges of choanæ are denticulated dermal ridges, which barely fail to meet medially; they border the choanæ behind; in the posterior palate are two dermal ridges in front of œsophagus, the posterior nearly straight, the anterior rather arched; tongue elongate, oval, not notched behind, free behind; male with internal vocal sac; head short, much wider than long; diameter of eye equal to its distance from tip of snout; snout truncate; nostrils rather widely separated, distance between them greater than their distance from eye; canthus rostralis rounded, lores slightly sloping; interorbital distance equal to one and one-third times the width of upper eyelid; pupil horizontal; tympanum almost entirely hidden; skin of body above smooth, as well as on limbs and underside of body, except about anal region and posterior part of thighs; a few indistinct smooth granules follow the dorsolateral line; a smooth fold from eye to insertion of arm; fingers entirely free, tips distended into large disks at least two-thirds diameter of eye; first finger much shorter than second, which in turn is somewhat longer than fourth, with a slightly larger disk; second finger fails to

reach disk of third; subarticular tubercles well developed; an indistinct tubercle on base of first finger, and a large flat tubercle on palm; legs moderate, toes about one-half webbed, provided with disks smaller than those on fingers; third toe, which is much longer than fifth, reaches first subarticular tubercle of fourth; subarticular tubercles of toes rather dim; a blunt, rather indistinct inner metatarsal tubercle; a small dim outer tubercle; skin of body joins femur about halfway from end; a slight fold on heel; hind leg brought forward the tibiotarsal articulation fails to reach angle of jaw.

*Color in life.*—Above grayish brown, not uniform; back with a large, rather regular spot, two branches of which touch the eyelids; it forks near the middle of back, each branch going to groin, and continues across the limb when folded; two irregular spots on either side of rump; loreal region rather darker; a dark, irregular, broken line from eye to groin, below which the color is slightly darker brown than on back; a dark spot on insertion of arm, one on elbow and one across wrist; a transverse light spot at upper base of digits; a dark spot on foot; posterior part of thigh dark; the dark color arching to include anus; below dull dusky brown, with darker brown marblings, spots, and reticulations.

*Measurements of Kaloula conjuncta (Peters).*

|                                | mm.  |
|--------------------------------|------|
| Length, snout to vent          | 47.5 |
| Length of head                 | 14   |
| Width of head                  | 17   |
| Interorbital width             | 6.1  |
| Length of snout                | 6    |
| Diameter of eye                | 6    |
| Depth of head, in front of eye | 6    |
| Foreleg                        | 37   |
| Longest finger                 | 16   |
| Diameter of disk on third toe  | 4    |
| Hind leg                       | 72   |
| Femur                          | 22   |
| Tibia                          | 20   |
| Foot                           | 31   |
| Longest toe                    | 21   |
| Largest toe disk               | 2.5  |

*Variation.*—No. 28, Bureau of Science collection, exhibits a remarkable variation; the skin of the back is puffed out so as to form a huge sac, as has been recorded by Günther in *Cacopus globosus* of India.\* In this specimen, a female, it would appear that the large dorsal skin sac was filled with air or fluid in life.

\* Rept. Brit. India (1864), 416.

It agrees in practically all characters with the specimen described; the color pattern is very dim; the dermal folds on palate are identical in arrangement; the denticulation on anterior folds is more evident. The specimen is a very large one, by far the largest example in the collection. Length, snout to vent, 68 millimeters; foreleg, 56; hind leg, 96. The locality is Manila.\*

I have sixteen females and eight males from Mindanao. A much larger series was collected, but the specimens were lost. The male differs from the female in that the former has a vocal sac, the chin is black, and the skin is somewhat distended and sometimes in folds; the toes are at least two-thirds webbed, the membrane frequently reaching the outer base of digits on first, second, and third toes, and the inner base of fifth. At first I believed I was dealing with distinct species, but when I found them breeding it was obvious that they were males and females.

A specimen collected by myself in Bubuan Island (Tapiantana Group), Sulu, is much darker, and the typical markings on the back are very distinct; there is a hair line from snout to vent along the middle of back.

One specimen, No. 790 E. H. Taylor collection, exhibits a series of small, light, dark-edged spots on the back and, especially, on the sides; the specimen is somewhat dried, but the webbing of the toes seems a little less than in normal specimens. The marking on the back is very indistinct. The specimen is from Guimaras Island. A Negros specimen has the upper surface covered with rough tubercles, and the posterior part of the belly granular.†

*Remarks.*—This species was described from a Luzon specimen, but I have been unable to find it in that island. In Mindanao, however, it is extremely common at certain seasons. It is known to the Manobos as *coquat*. At Bunawan, Agusan, the breeding season for this frog began November 28, 1912, after a storm with heavy rainfall. From the time of my arrival in June to that date I had not observed a single specimen. During the night of the 27th, a large depressed area in the swamp near the house filled with water, and thousands of these toads collected from all parts of the forest. Their croaking made an ominous roar, easily heard a kilometer away. The note is *chuck-chuck-chuck*

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\* The specimen was collected by Mrs. Graham, who presented it to the Bureau of Science together with certain Philippine snakes (*Dryophiops philippina*). I believe there is no doubt as to the locality, although I have been unable to verify it.

† This may belong to a different species, differing chiefly in being much smaller.

rapidly repeated. Males seem to occur in larger numbers than females; not infrequently females were observed mounted by four or five males. The male apparently exudes a sticky substance on the belly which fastens him to the female. Occasional specimens were found mounted by males of *Kalophrynus stellatus* that were breeding at the same time. While the eggs were being deposited, the frogs swam about on the surface of the water.

The species is arboreal and burrowing. When a small *Pandanus* tree, about 7 meters high, was cut, twelve specimens were taken from the axils of the leaves. Others were unearthed by my collectors from about peanut and *camote* vines. They appear to feed largely, if not wholly, on ants. The type is from Luzon.

#### Genus *KALOPHRYNUS* Tschudi

*Kalophrynus* TSCHUDI, Class. Batr. (1838) 36; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 54; COPE, Journ. Acad. Nat. Sci. Philadelphia II 6 (1867) 195; STEJNEGER, Proc. U. S. Nat. Mus. 33 (1908) 575. *Berdmorea* STOLICZKA, Proc. As. Soc. Bengal (1872) 146. *Kalophrynus* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 157.

No teeth in jaws; no vomerine teeth; a dermal ridge across palate between or behind choanæ; one or two dermal denticulated ridges between, and in front of, Eustachian tubes; head small; mouth small; tongue oval, free or notched behind; tympanum distinct; skin of back thick and glandular like a parotoid; pupil horizontal; fingers free, toes partially webbed, digits without disks; outer metatarsals united, coracoids broad, abutting; precoracoids weak, parallel with latter; omosternum and sternum cartilaginous; diapophyses of sacral vertebra moderately dilated; terminal phalanges simple.

The genus is known from southern China, Borneo, and the Philippines. Two species have been described from the Philippines; one from Mindanao, the other from either Culion or Samar.

#### *Key to the Philippine species of Kalophrynus Tschudi.*

a<sup>1</sup>. Snout pointed; tongue nearly circular; tibiotarsal articulation reaches tympanum; tympanum four-fifths eye; no sacral spots.

*K. acutirostris* (Boettger) (p. 132).

a<sup>2</sup>. Snout pointed or blunt; tongue oval; tibiotarsal articulation reaches eye; tympanum about three-fourths eye; two black, white-edged sacral spots..... *K. stellatus* Stejneger (p. 130).

These small toads are terrestrial. When taken in the hand alive they exude a white viscous fluid from the entire surface of the back, which sticks to the hand with great tenacity and takes much effort to remove.

## KALOPHRYNUS STELLATUS Stejneger

PLATE 9, FIG. 2

*Kalophrynus stellatus* STEJNEGER, Proc. U. S. Nat. Mus. 33 (1908) 575.

*Description of species.*—(From No. 216, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, P. I., June, 1912, by E. H. Taylor.) Tongue roundly oval, not notched behind; no vomerine teeth; a strong, smooth, distinct dermal ridge running across palate just posterior to choanæ, forming a slight angle medially and not separated medially; choanæ concealed under overhanging jaw; a strongly denticulated dermal ridge running straight across palate in front of œsophagus between the Eustachian tubes; a second arched dermal ridge in front of this, much shorter, the space between triangular; head triangular, slightly wider than long; canthus rostralis roundly angular; loreal region nearly vertical; snout pointed; nostril nearer tip of snout than eye; distance between nostrils greater than their distance from eye; eye large, prominent, its diameter equal to its distance from snout; tympanum large, distinct, very close to eye, its diameter about three-fourths of diameter of eye; interorbital space one and one-half times the width of a single eyelid; skin of back very thick, glandular, covered with small granules; a few larger granules on eyelid; chin and breast rather smooth; belly and underpart of thighs very strongly granular, the granules large and fairly uniform; a distinct supratympanic fold, which limits the thick padded skin of occiput; no dorso-lateral fold; fingers short, first and fourth equal, neither extending as far as third; second reaching first subarticular tubercle of third; tips slightly swollen; subarticular tubercles strong, somewhat keeled; toes short; third, distinctly longer than fifth, does not reach farther than second subarticular tubercle of fourth; a well-defined inner metatarsal tubercle, about two-thirds the length of first toe; outer tubercle very indistinct; toes about one-third webbed, the membrane reaching halfway up on digits, on the outer side of first three digits, and on inner side of fifth; fails considerably to reach second tubercle on fourth.

*Color in life.*—Above pinkish gray, mottled and marked with somewhat darker color; an irregular darker stripe runs from right eyelid to left groin, and another from left eye to right groin, crossing on shoulders. At end of each stripe is a distinct, round, light-edged black spot; balance of area mottled with irregular, lighter-edged markings; a distinct dark stripe across femur and another across tibia, which form continuations of the two

dorsal stripes when limbs are folded; a dark spot on outer side of foot, on elbow and wrist; fingers barred with dark and light bars; side of head and body dark black-brown, bordered above by a continuous lighter line, which limits the dorsal color; chin carmine to red-brown; posterior part of body reddish yellow; a few scattered bright yellow-orange spots on breast and belly; heel and underside of wrist dark. In the anal region there is a transverse lighter line, which limits the upper body color; below this line darker on posterior part of thighs.

*Measurements of Kalophrynus stellatus Stejneger.*

|                         | mm.  |
|-------------------------|------|
| Length, snout to vent   | 45   |
| Length of head          | 14.5 |
| Length of snout         | 5.5  |
| Width of head           | 16   |
| Diameter of eye         | 5.5  |
| Diameter of tympanum    | 4    |
| Interorbital width      | 5.8  |
| Width of body, greatest | 28   |
| Foreleg                 | 32.5 |
| Longest finger          | 13   |
| Hind leg                | 63   |
| Femur                   | 20.5 |
| Tibia                   | 20   |
| Foot                    | 23   |
| Longest toe             | 16.5 |

*Variation.*—There are twenty-eight specimens in my collection from Bunawan, all taken in the same immediate locality. They exhibit very striking variations in color and markings and slight variations in amount of webbing of toes, the pointedness of the nose, and comparative length of limbs. The typical pattern is the one described. The sacral spots are usually present, of varying size; but in one specimen they are entirely wanting, and in another the spot is wanting on one side and represented on the other by a very small dark area. In some specimens the nose is sharply pointed, ending in a small tuberclelike prominence; in others it is bluntly pointed, and in still others the snout is rather truncate; in some the skin is comparatively smooth, in others uniformly granular. The thick glandular structure of the skin is more evident in the largest specimens. It appears as a huge parotoid covering the entire back and sides. One specimen shows two distinct lateral black spots other than the inguinal spot.

*Remarks.*—The type of *Kalophrynus stellatus* measures only 24 millimeters and is doubtless an immature form of the spec-

imen described here. The variations are obvious. Stejneger states that there is no supratympanic ridge. In young specimens in my collection the fold is very dim, but distinct in older ones; the "small star-shaped spots" are rarely evident on the back, but on breast and belly they are usually numerous, although frequently entirely wanting. The smallest specimen in the collection measures only 15 millimeters.

It is not improbable that *Kalophrynus stellatus* and *K. acutirostris* are merely variations of the same species. It will be noted that I have described a specimen of very nearly the same size as the type of *K. acutirostris*. The limbs are distinctly longer than in Boettger's species.

*Kalophrynus stellatus* is common in western Mindanao, especially in the swampy forests of the upper Agusan country. They are usually encountered hopping about during or after a rain; they are very clumsy and very easily captured. During the breeding season of *Kaloula conjuncta* at Bunawan several male specimens of *Kalophrynus stellatus* were taken clasping females of the other species. In spite of their being common I failed to discover their tadpoles. Several females in the collection, including the one described, are packed with eggs. The eggs are small, measuring about 1 millimeter in diameter.

This species is known from Bunawan, Agusan, in Mindanao, and from Basilan. Three specimens were collected by myself in the latter island, which is the type locality. The types were collected by E. A. Mearns.

#### KALOPHRYNUS ACUTIROSTRIS (Boettger)

*Kalophrynus acutirostris* BOETTGER, Zool. Anz. 20 (1897) 165.

*Kalophrynus acutirostris* STEJNEGER, Proc. U. S. Nat. Mus. 33 (1908) 576.

*Description of species.*—(After Boettger.) No vomerine teeth present, tongue almost circular, as wide as long; snout sharp, peak-shaped; the outer metatarsal tubercle very indistinct; thighs comparatively short; the tibiotarsal articulation reaches only to the posterior edge of the tympanum; skin on back finely granulated, the granules of equal size; tympanum four-fifths of eye; head wider than long.

*Color.*—Above grayish red with very indistinct, darker, island-like branched spots; head and sides of back darker, almost blackish, bordered above with a fine whitish longitudinal line; in the anal region a whitish transverse line; thighs with darker transverse bands; no round, dark, light-bordered inguinal spot.

*Measurements of Kalophrynus acutirostris (Boettger).*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 44   |
| Length of head        | 12   |
| Width of head         | 15   |
| Diameter of eye       | 5    |
| Tympanum              | 4    |
| Foreleg               | 27   |
| Hind leg              | 51   |
| Femur                 | 19   |
| Tibia                 | 17.5 |
| Foot                  | 23   |

*Remarks.*—This species differs from *Kalophrynus pleurostigma* Tschudi in having the subcircular tongue, the snout more protracted, the hind legs shorter, and the inguinal spots lacking. It also differs from *K. stellatus* in having the subcircular tongue, the snout pointed, the hind legs shorter, and no sacral spots. The species is known from a single specimen. It is from either Samar or Culion ("entweder von Culion oder von Samar").\*

## Genus CHAPERINA Mocquard

*Chaperina* MOCQUARD, Mem. Soc. Zool. France 5 (1892) 194; Le Natural. 14 (1892) 35.

Tongue elliptical, not forked behind, free; no vomerine teeth; rather indistinct bony ridge across the palate behind choanæ sometimes present; on posterior part of palate in front of œsophagus one or two dermal folds, choanæ rather large, hidden under edges of maxilla; tympanum present or wanting; fingers and toes entirely free, dilated into small disks; no parotoid gland; inner metatarsal tubercle present; terminal phalanges T-shaped; outer metatarsals united. Pupil horizontal; precoracoids present, very slender; sternum cartilaginous; no omosternum. Transverse process of sacrum rather strongly dilated.

*Remarks.*—This genus was established for *Chaperina fusca* Mocquard from Sintang, Borneo. Mocquard states that it is most closely related to *Sphenophryne* Peters and Doria. Two species are known from the Philippines, both new. *Chaperina beyeri* is closely related to *C. fusca* but appears to differ in certain organic characters, such as the presence of a distinct dermal soft spine on the heel and the absence of tympanum.

*Key to the Philippine species of Chaperina Mocquard.*

- a<sup>1</sup>. Black above, with or without yellow specks; yellow below reticulated with black; dermal spine on heels; belly smooth.

*C. beyeri* Taylor (p. 134).

\* Boettger, loc. cit.

- a<sup>o</sup>. Brown above, with a median white stripe; two light areas on either side of back and a ) (-shaped light mark extending in front and on either side of anus; belly granular; no dermal spine.

C. visaya Taylor (p. 136).

#### CHAPERINA BEYERI Taylor

##### PLATE 3, FIG. 3

*Chaperina beyeri* TAYLOR, Philip. Journ. Sci. 16 (1920) 333.

*Type*.—No. 557, E. H. Taylor collection; collected in upper Agusan, Mindanao, between Agusan and Simulao Rivers (probably in Davao or near the Davao-Agusan line), June, 1913, by E. H. Taylor.

*Description of type*.—Vomerine teeth wanting; choanæ moderate, rather hidden under edges of jaw; a small bony ridge across palate in front of eyes and behind choanæ, somewhat angular medially; a small dermal ridge, rather indistinct in hinder part of palate; head wider than long; snout short, truncate; nostrils nearer tip of snout than eye, distance between them much greater than their distance from eye; eye rather small, diameter somewhat less than length of snout; pupil appears round; interorbital width more than one and two-thirds times eyelid; tympanum wanting, but a slight depressed area in temporal region evident in dried or overpreserved specimens; a distinct groove from tympanic region to arm with a very indistinct fold above the groove; fingers unwebbed, with well-developed disks; first finger very short, with only small terminal disk, and only reaches base of second; fourth longer than second, reaching base of disk on third; subarticular tubercles large; elbow with a distinct dermal spine; toes unwebbed, with distinct terminal disks; first toe reaches subarticular tubercle of second; third much longer than fifth; heel with a distinct, sharp, dermal spine; hind limb brought forward, the tibiotarsal articulation reaches eye; skin smooth both on entire upper and on lower surface. Male apparently without vocal sac.

*Color in life*.—Above dark brown to blackish; on sides of head and body, on posterior part of back, and above limbs are small lemon yellow dots of varying size; limbs very dimly marked with irregular darker bars; dermal spines on limbs yellow; belly and underside of limbs yellow to orange spotted, and reticulated with brownish, forming rather rounded yellow spots; a distinct light spot at base of digital disk above and below; subarticular tubercles black, some with a dividing whitish line.

*Measurements of Chaperina beyeri Taylor.*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 23   |
| Width of head         | 7    |
| Length of head        | 6    |
| Width of body         | 12   |
| Length of snout       | 3    |
| Diameter of eye       | 2.5  |
| Tibia                 | 12   |
| Foreleg               | 13   |
| Hind leg              | 33.5 |

*Variation.*—Specimens from Palawan agree very well in most characteristics; some are darker, almost coal-black with practically no yellow or white dots above, while others are lighter, gray-brown, with black-brown bars on legs, and very indistinct markings on back; males appear to have more dusky markings on throat than females. Mindanao specimens have the ground color of throat dark, with roundish yellow spots.

*Tadpoles.*—A good series of tadpoles was taken, from specimens with no legs to those that had completed their transformation. In the same pool of water another large tadpole was taken, but I am unable to identify it. Description of specimen: Total length, 23 millimeters; body, 9; tail, 14; hind legs, 10. Eyes very distinct, lateral, distance between them more than twice their distance to end of snout; nostrils close together, nearer tip of snout than eye; spiracle on left side. Owing to the state of preservation I am unable to determine the characters of the teeth and labial dental characters. Color blackish, rather lighter below.

*Remarks.*—This species was first discovered in June, 1913, in the low mountains along the boundary of Davao and Agusan Provinces, Mindanao, between Agusan and Simulao Rivers. Several adults were taken in a small pool of water in a hole in a tree trunk, only about one-third meter above ground. In May, 1918, several specimens were taken in the extreme northern part of Palawan. Young and adult specimens were found under rocks along nearly dry stream beds in low mountains; later tadpoles were found in a water-filled cavity, nearly a meter from the ground, close to the base of a large tree, not far from the same stream.

The adults are very agile and, owing to their small size and dark color, are seen only with difficulty. Certainly common in northern Palawan, but probably rare in Mindanao. Known from only these two localities in the Philippines.

## CHAPERINA VISAYA Taylor

PLATE 9, FIG. 3

*Chaperina visaya* TAYLOR, Philip. Journ. Sci. 16 (1920) 335.

*Type*.—No. B80, Bureau of Science collection; collected on Biliran Island, May, 1914, by R. C. McGregor.

*Description of type*.—Head broader than long; tongue oval, not notched behind; choanæ small, nearly hidden under edge of jaw; no vomerine teeth or palatal ridge; two transverse dermal ridges in front of œsophagus, the anterior rather arched; eye large, its diameter equal to its distance from tip of snout; canthus rostralis rounded; lores vertical, not concave; snout rounded, projecting somewhat; nostril nearer tip of snout than eye; interorbital region nearly twice the width of upper eyelid; tympanum not visible; a very dim fold from eye to foreleg; skin above smooth, with two prominent tubercles on shoulders; numerous other tubercles on posterior part of back, sides and limbs; a skin fold from angle of jaw to foreleg; fingers free, with broad disks, second and fourth nearly same length; sub-articular tubercles dim; toes free, with disks smaller than those on fingers; a flat outer metatarsal tubercle, inner dim or wanting; subarticular tubercles dim; the tibiotarsal articulation fails to reach eye.

*Color in formalin*.—Above variegated brown with a somewhat darker area on head; a median very narrow light line; two rather large light spots on either side of middle of back with an H-shaped mark extending above and on either side of anus. These markings, together with the dorsal markings, give an appearance of a caricature of a man's face; under surface of belly and limbs dirty white; chin darker than belly.

*Measurements of Chaperina visaya Taylor.*

|                           | mm.  |
|---------------------------|------|
| Snout to vent             | 19.5 |
| Width of head             | 7    |
| Length of head            | 6.5  |
| Diameter of eye           | 2.8  |
| Length of snout, from eye | 3    |
| Interorbital distance     | 3.5  |
| Foreleg                   | 12   |
| Hind leg                  | 28   |
| Femur                     | 9    |
| Tibia                     | 9    |
| Longest toe               | 8.8  |

*Remarks*.—The type is the only specimen known. It is with some hesitancy referred to the genus *Chaperina* as it differs

somewhat from that genus in the palatal characters. It is not improbably a species of *Sphenophryne*. No specimen of that genus is at hand for study.

Genus **PHRYNIXALUS** Boettger

*Phrynixalus* BOETTGER, Zool. Anz. 18 (1895) 17; STEJNEGER, Proc. U. S. Nat. Mus. 33 (1908) 573.

No vomerine teeth; with or without a doubly arched palatal ridge; a smooth dermal ridge in front of Eustachian tubes and another denticulated one behind them; tongue large, rounded, free; tympanum present; fingers and toes free, with disks; no subarticular tubercles; no metatarsal tubercles; pupil horizontal.

*Remarks.*—In this genus, only *Phrynixalus annulatus* Stejneger is known from the Philippine Islands. This differs somewhat from the genotype, in that it lacks the doubly arched palatal ridge.

**PHRYNIXALUS ANNULATUS** Stejneger

*Phrynixalus annulatus* STEJNEGER, Proc. U. S. Nat. Mus. 33 (1908) 573.

*Description of species.*—"No vomerine teeth; no ridge between or behind the choanæ which are large, but nearly concealed by the overhanging lip; an indistinct, smooth dermal ridge between the eustachian tubes, and a well-marked denticulated one behind them; tongue large, rounded behind, extensively free (about one-half) behind and on sides; snout somewhat acuminate, projecting; nostrils much nearer tip of snout than eyes; distance from tip of snout to eye greater than diameter of latter; interorbital space nearly twice as wide as upper eyelid; canthus rostralis rounded; lores concave; tympanum rather distinct, its diameter about one-half that of the eye; fingers free, club-shaped, first very much shorter than second, much less widened at the tip than the others, the tips of which are nearly truncate; toes entirely free, the tips dilated, but not quite so much as the fingers; no subarticular tubercles and no metatarsal tubercles; outer metatarsals united; skin smooth above; upper eyelid granular with a larger and more prominent tubercle near the middle of the palpebral edge; underside smooth, except belly which is faintly areolated, and the preanal region, which is granular.

*Color (in alcohol).*—"Dark brown above, with an indistinct pale band between the anterior half of the upper eyelids followed by a dusky cross-bar; on the shoulders a large, indistinct, W-shaped, dusky mark, the outer arms of which anteriorly reach to

the posterior corner of the eyes; an indistinct, large, pale spot on each side of the sacrum; an oblique, pale, dusky-edged line from eye to fore leg; underside paler brown, minutely dotted with whitish; limbs like the body, faintly mottled with dusky, but without distinct cross bars; fingers and toes with a very distinct dusky ring behind the expanded tip or disk, followed by an equally distinct ring of whitish color." (*Stejneger*.)

*Measurements of Phrynixalus annulatus Stejneger.*

|   | mm.  |
|---|------|
| Total length, tip of snout to vent                  | 14.5 |
| Tip of snout to tympanum                            | 4.5  |
| Width of head                                       | 5.0  |
| Length of foreleg                                   | 8.5  |
| Length of hind leg, from vent to tip of longest toe | 20.0 |
| Length of tibia                                     | 6.0  |

*Remarks.*—This species was discovered in Davao, Mindanao, in 1904, by E. A. Mearns. Two specimens were taken, one on Mount Apo, at an elevation of about 1,230 meters. This species differs from other members of the genus by the absence of the doubly arched ridge across the palate, and by the difference in the shape of the pupil of the eye.

### BUFONIDÆ

No maxillary teeth present; diapophyses of sacral vertebra dilated; vertebræ procœlian and without ribs; the coccyx attached to two condyles; omosternum generally absent; distal phalanges obtuse or T-shaped; pupil usually horizontal.

The true toads belong to this family. It is a large family, cosmopolitan in distribution. There are comparatively few genera in the family. More than three-fourths of the known species belong to the genus *Bufo*. Two genera are known from the Philippines, *Bufo* and *Nectophryne*.

*Key to the Philippine genera of the Bufonidæ.*

- a.<sup>1</sup> Fingers slightly webbed; toes webbed, the tips more or less dilated into disks; pupil horizontal; terminal phalanges T-shaped. *Nectophryne* Buchholz and Peters (p. 138).  
 a.<sup>2</sup> Fingers free; toes more or less webbed, with or without disks; terminal phalanges simple..... *Bufo* Laurenti (p. 141).

### Genus NECTOPHRYNE Buchholz and Peters

*Nectophryne* BUCHHOLZ and PETERS, Mon. Berl. Ak. (1875) 202;  
 BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 279; ROUX,  
 Proc. Zool. Soc. London (1906) 58.

*Pedostibes* GÜNTHER, Proc. Zool. Soc. London (1875) 576.

Toadlike; pupil horizontal; tympanum distinct, partly hidden or absent; fingers and toes partially or wholly webbed, tips

dilated into distinct disks; outer metatarsals united; no omosternum; sternum cartilaginous; diapophyses of sacral vertebra dilated; terminal phalanges T-shaped.

The distribution of this genus is rather unusual, as far as it is known. Species are known from West Africa and from East Africa; six species have been recorded from Borneo, one of which occurs also in the Natuna Islands and Singapore; one species is found in Malabar; and I have recently found a species in Mindanao.

*Nectophryne sundana*, described by Peters from Borneo, has been considered as a doubtful species by both Boulenger and Roux; in his review of the genus the latter does not include the species but remarks:

I conclude with a synoptic table for the determination of the known species of *Nectophryne*, not taking into consideration doubtful species, as e. g. *Nectophryne sundana* (Ptrs.) (Boulenger, Cat. Batr. Sal. p. 281.). I have not been able to examine the only existing specimen of this species, which is preserved in the Berlin Museum and comes from Borneo.

It is significant that Roux does not notice the record of this species from Mindanao, recorded by F. Müller \* and listed by Boettger.† It would appear that this specimen has disappeared or, what is still more likely, has been referred to some other species or genus. At any event, I shall not include the species on the strength of the Müller report. Whether or not the specimen that Müller had before him was of the species here described is a matter of conjecture.

#### NECTOPHRYNE LIGHTI Taylor

PLATE 7, FIGS. 3 AND 3a

*Nectophryne lighti* TAYLOR, Philip. Journ. Sci. 16 (1920) 338.

*Type*.—No. 189, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, July, 1913, by E. H. Taylor.

*Description of type*.—Choanæ moderately large, hidden under the overhanging jaw; body not especially slender; head slightly longer than broad; snout distinctly truncate with a groove between the rather raised prominences in which the nostrils are pierced; nostrils near extreme end of snout; in profile the snout slopes back and down to mouth in a rather concave line; eye large, its length a little greater than the length of snout; tympanum large, its greatest diameter about two-thirds that of eye, separated from eye by a distance equal to about one-third its

\* III. Nachtr. Cat. Herp. Samml. Basel Mus. (1883) 7.

† Ber. Senck. Nat. Ges. (1886) 125.

greatest length; interorbital distance about twice the width of upper eyelid, much greater than the length of snout; the interorbital area and occipital area raised somewhat; loreal region vertical, concave; skin above with large tubercles, which are moderately smooth, very numerous dorsolaterally and along sides; middle part of back comparatively smooth; a rather prominent parotoidlike tubercle on each shoulder; temporal regions strongly tubercular; top of head, save eyelids, smooth; chin, throat, and belly free from granules; limbs very slender; fingers very slightly dilated at tips, truncate, webbed, the membrane between fingers reaching more than halfway on first and second fingers; first finger about half the length of second; toes about three-fourths webbed, the membrane reaching tip of first and second toes and tip on outer side of third.

*Color*.—Chestnut brown above, with occasional lighter areas; rather darker on sides; a distinct cream-yellow spot begins below anterior part of eye and continues to below tympanum; three small cream spots behind angle of mouth; limbs lighter, with darker chestnut markings; feet and hands yellowish brown; dusky yellowish brown below, with irregular white spots, which also occur low on sides.

*Measurements of Nectophryne lighti Taylor.*

|                       | mm.  |
|-----------------------|------|
| Length, snout to vent | 15   |
| Length of head        | 5.2  |
| Width of head         | 5    |
| Length of snout       | 1.5  |
| Foreleg               | 10.8 |
| Hind leg              | 21   |
| Tibia                 | 6.5  |
| Femur                 | 6    |
| Longest toe           | 5    |

*Remarks*.—Only a single specimen known. It is from Bunawan, Agusan, where it was taken in a forest among leaves, a few hundred meters from water.

Just what relation this species bears to the Borneo species, I cannot say. It is, however, clearly distinguished by the very numerous large tubercles on its back and sides. It agrees with *Nectophryne guentheri* Boulenger in having the skin of the sides attached to the leg, but differs from the latter not only in size and number of tubercles, but also in having a broader interorbital distance, with apparently no metatarsal tubercles.

The species is dedicated to Prof. Sol F. Light, of the University of the Philippines, who has manifested much interest and given assistance in this work.

## Genus BUFO Laurenti

*Bufo* LAURENTI, Syn. Rept. (1768) 25; WAGLER, Syst. Amph. (1830) 206; TSCHUDI, Class. Batr. (1838) 88; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 662; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 55; COPE, Nat. Hist. Rev. (1865) 102; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 281; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 55.

*Hylaplesia* BOIE, Isis (1827) 294; PETERS, Mon. Berl. Ak. (1867) 34.  
*Phrynoides* COPE, Proc. Acad. Nat. Sci. Philadelphia (1863) 357.

"Pupil horizontal. Tongue elliptic or pyriform, entire and free behind. Vomerine teeth none. Tympanum distinct or hidden, seldom absent. Fingers free; toes more or less webbed, the tips simple or dilated into small disks. Outer metatarsals united. Omosternum generally missing; if present, cartilaginous; sternum a cartilaginous plate; sometimes more or less ossified along the median line. Diapophyses of sacral vertebra more or less dilated. Terminal phalanges obtuse or triangular." (*Boulenger.*)

Key to the Philippine species of *Bufo* Laurenti.

- a<sup>1</sup>. Crown without bony ridges; toes with well-developed disks.
  - b<sup>1</sup>. First finger shorter than second; toes half webbed; no metatarsal tubercles; two small parotoids on each side.
    - B. brevipes* (Peters) (p. 141).
  - b<sup>2</sup>. First finger much shorter than second, not any or but slight disks; toes webbed to the tips; no parotoids.
    - B. muelleri* Boulenger (p. 142).
- a<sup>2</sup>. Crown with bony ridges.
  - b<sup>1</sup>. Cranial ridges distinct, curving behind eye to tympanum; no parietal ridges..... *B. melanostictus* Schneider (p. 143).
  - b<sup>2</sup>. Cranial ridges usually confluent with parietal ridges.
    - B. philippinicus* Boulenger (p. 145).

## BUFO BREVIPES (Peters)

*Hylaplesia brevipes* PETERS, Mon. Berl. Ak. (1867) 34.

*Bufo brevipes* BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 287;  
 BOETTGER, Ber. Senck. Nat. Ges. (1886) 125; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 452.

*Description of species.*—Habit rather slender; crown without bony ridges; snout obliquely truncate with angular canthus rostralis; loreal region vertical; interorbital space broader than upper eyelid; tympanum rather distinct; sides of body thickly ornamented with tubercles; two small parotoid glands on each side, one on neck, the other near shoulder; foreleg reaches posterior end of body; first finger very short, projecting like a small tubercle; tips of fingers dilated into well-developed disks; third finger 2 millimeters in length; palm of hand smooth; first three

toes scarcely extend beyond the swollen interdigital skin; first and last toes as long as corresponding fingers; toes with disks similar to those on fingers; sole of foot smooth, with no metatarsal tubercles present; hind limb brought forward reaches to center of eye. (After Peters.)

*Color.\**—Presumably blackish brown above, with white spots, beneath marbled brown.

*Measurements of Bufo brevipes (Peters).*

|                       | mm. |
|-----------------------|-----|
| Length, snout to vent | 18  |
| Foreleg               | 13  |
| Hind leg              | 23  |
| Femur                 | 7   |
| Tibia                 | 7   |
| Tarsus                | 4   |
| Entire foot           | 10  |

*Remarks.*—The types are from Zamboanga, Minadanao, and were collected by Semper. Only the two type specimens appear to have been found.

**BUFO MUELLERI Boulenger**

*Bufo muelleri* BOULENGER, Ann. & Mag. Nat. Hist. V 20 (1887) 52.

*Description of species.*—"Closely allied to *B. pulcher* Boulenger. Crown without bony ridges; snout short, obliquely truncate, with perpendicular lores; interorbital space broader than the upper eyelid; tympanum very indistinct, fingers rather long, somewhat widening and truncate at the end, first much shorter than second; toes rather short, webbed to the tips, which are slightly swollen; metatarsal tubercles, two, flat and very indistinct; the membrane bordering the inner toe extends as a fine fold along the tarsus. The tibio-tarsal articulation reaches the anterior border of the orbit. Skin nearly smooth above, granular inferiorly; no parotoids. Black above with lighter wavy lines or marblings, and with round white dots on the sides and limbs; throat and belly marbled with brown. Male with a subgular vocal sac.

"From snout to vent 30 millim." (*Boulenger.*)

*Remarks.*—The type, a male specimen from Mindanao, is in the British Museum of Natural History. No other specimen is known.

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\* Said to agree with *Bufo borbonicus* Boie.

## BUFO MELANOSTICTUS Schneider

- Bufo melanostictus* SCHNEIDER, Hist. Amph. 1 (1799) 216; GRAVENHORST, Delic. Mus. Vratislav. (1829) 57; CANTOR, Cat. Mal. Rept. (1847) 142; GIRARD, U. S. Expl. Exp., Herp. (1858) 92, pl. 5, figs. 10-14; GÜNTHER, Rept. Brit. India (1864) 422; STEINDACHNER, Novara Exped., Zool. 1, Amph. (1869) 42; STOLICZKA, Proc. As. Soc. Bengal (1870) 155; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 306; Fauna Brit. India, Rept. (1890) 505; BOETTGER, Offenb. Ver. Naturk. (1885) 131; FLOWER, Proc. Zool. Soc. London (1896) 911, pl. 44, fig. 3; BOETTGER, Ber. Senck. Nat. Ges. (1886) 125; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1896) 452; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 73, figs. 58-61.
- Bufo scaber* DAUDIN, Hist. Nat. Rain. (1803) 94, pl. 34, fig. 1; Rept. 8: 194; TSCHUDI, Class. Batr. (1838) 88; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 699; SCHLEGEL, Abbild. Amphib. (1837) 64, pl. 20, fig. 2; VAN KAMPEN, Zool. Ergeb. Max Weber's Reise 4 (1907) 2, 416.
- Bufo bengalensis* DAUDIN, Hist. Nat. Rain. (1803) 96, pl. 35, fig. 1; LESSON in Bélang. Voy. Ind. Or., Rept., 334.
- Bufo isos* LESSON in Bélang. Voy. Ind. Or., Rept., 333; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 702.
- Bufo gymnauchen* BLEEKER, Nat. Tijdschrift Nederl. Ind. 16 (1858) 46.
- Phrynoides melanostictus* COPE, Proc. Acad. Nat. Sci. Philadelphia (1863) 357.
- Bufo spinipes* STEINDACHNER, Novara Exped., Zool. 1, Amph. (1869) 42.
- Bufo meranostictus* STEJNEGER, Journ. Sci. Coll. Tokyo 12 (1898) 216 (typ. err.).

*Description of species.*—"Head with strongly developed bony crests, involving the upper lip, a rostral ridge on end of snout from lip to between nostrils, there bifurcating and continuing on canthus rostralis, along supraorbital border to above the tympanum, forming there a knob-like prominence and sending a branch downward along the anterior border of the tympanum; a slight parietal spur indicated, also a short anteorbital spur or crest; nostrils nearer the tip of the snout than the eye; interorbital space deeply concave, much wider than upper eyelid, which is strongly tubercular and with thickened glandular edges; tympanum vertical, oval or almost pear-shaped, separated from the orbit by a very narrow space, its longest diameter about three-fourths the diameter of the eye; parotoids large, swollen, kidney-shaped; first finger reaches considerably beyond second which does not quite reach as far as fourth; an elongate inner and a much larger outer palmar tubercle; subarticular tubercles single, prominent; palm, underside, and edges of

fingers with numerous pointed tubercles which, like all the other digital tubercles and the horny tip of the fingers, are blackish brown; heels just meeting when hind legs are placed at right angles to axis of body; metatarsal tubercles reaching at right angles to axis of body; metatarsal tubercles reaching posterior corner of eye when hind legs are placed forward along the sides of the body; toes less than one-half webbed, the webs being greatly excised and their edges sharply denticulate; inner metatarsal tubercle prominent, oval, shorter than first toe, outer one large, rounded, less prominent; the single subarticular tuber-

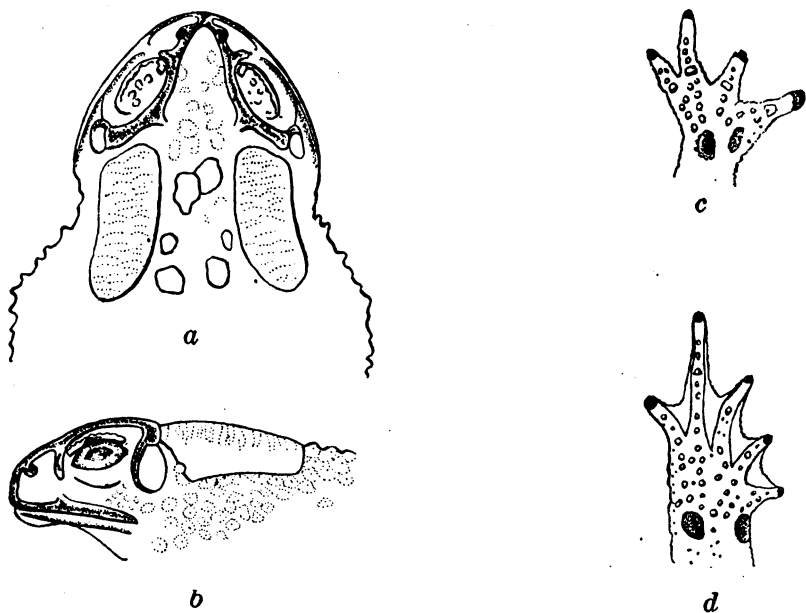


FIG. 9. *Bufo melanostictus* Schneider; after Stejneger; a, top of head; b, side of head; c, hand; d, foot.

cles, plantar tubercular asperities, and tip of toes like those on the fore foot; skin strongly tubercular, the tubercles on the back larger, more distant, glandular, rounded, those on sides and limbs more prominent, almost conical, all with a horny dark-brown tip, which on sides and limbs becomes spinous.

*Color (in alcohol).*—"Clay-colored above, more pure pale ocheryellow underneath, all the crests and nearly all the tips of the tubercles dark brown, as are also the elevated fine vermiculations on the surface of the parotoids; indistinct dusky spots and coarse vermiculations on limbs, sides, throat, and breast." (*Stejneger.*)

*Measurements of Bufo melanostictus Schneider.*

|   | mm. |
|---|-----|
| Tip of snout to vent  | 84  |
| Tip of snout to anterior border of tympanum                             | 20  |
| Nostril to tympanum   | 16  |
| Internasal width  | 5   |
| Interorbital width  | 8.5 |
| Longest diameter of tympanum  | 5.5 |
| Width of head   | 31  |
| Foreleg   | 50  |
| Hind leg, from vent to tip of longest toe                               | 99  |
| Tibia   | 26  |
| Hind foot, from base of inner metatarsal tubercle to tip of longest toe | 30  |
| Length of parotoid  | 20  |
| Width of parotoid   | 8   |

*Remarks.*—This species is included on the strength of Boulenger's record of a female specimen from "Philippine Islands." \* The fact that no further specimen has been taken in the Philippines leads me to believe that it must be extremely rare here or that the record is in error.

## BUFO PHILIPPINICUS Boulenger

## PLATE 9, FIG. 5

*Bufo philippinicus* BOULENGER, Ann. & Mag. Nat. Hist. V 19 (1887) 348, pl. 10, fig. 5; VI 14 (1894) 88.

*Bufo divergens* MOCQUARD, Nouv. Arch. du Mus. III 2 (1890) 158.

*Description of species.*—(From No. R1760, Bureau of Science collection; collected at Taytay, Palawan, P. I., April, 1913, by L. E. Griffin.) Choanæ longer than wide, well in view; no vomerine teeth; palate with a transverse denticulated bony ridge, more or less interrupted medially; head angular, distinctly wider than long; canthus rostralis with low bony crests, which continue back between the eyes to occipital region, where they join the occipital ridges, become confluent with them, and make an angular turn inward; a branch is given off immediately behind eye which curves around, ending at the anterior outer edge of parotoid; posterior part of bony crests higher and thicker than anterior part; distance between crests greatest just posterior to eye; eye large, its length equal to length of snout; eyelid projecting strongly, its width about equal to interorbital space between the bony crests; nostril much nearer tip of snout than eye; canthus rostralis angular, sloping very gently; loreal region not or but slightly concave; tympanum oval, its outline very

\* Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 307.

distinct except on upper border, its diameter about two-thirds eye; distance between tympanum and eye equal to about half the greatest diameter of latter; parotoids large, very distinct, slightly oblique, one and two-thirds times as long as broad; temporal area behind crests depressed; eyelids strongly tubercular; a prominent tubercle on both anterior and posterior corners of eyelid; entire upper surface with spiny tubercles of unequal size, the largest ones in the median dorsal region; large spiny tubercles behind angle of jaws to above arm; a distinct single tubercle between parotoid and end of occipital crests; entire upper surface of limbs, as well as soles of feet, with spiny tubercles; belly, throat, and underside of limbs with rather uniform small granules; fingers without web; first finger thick, extending farther than second or fourth; a large, keeled, oval tubercle on palm as long as second finger; a smaller conical tubercle on outer base of first finger; subarticular tubercles not very distinctly differentiated from other granules; toes about one-third webbed, third toe distinctly longer than fifth; a strong inner metatarsal tubercle as long as first toe; strong flat oval outer tubercle; subarticular tubercles not well differentiated from other granules; tibiotarsal articulation reaches a little beyond posterior part of parotoid.

*Color in alcohol.*—Above uniform brownish, no markings being visible; sides dark brown to black; head lighter variegated brown; parotoids lighter brown than back; limbs with very indistinct darker and lighter marks; below dirty yellowish brown, with spots and mottlings of brownish.

*Measurements of Bufo philippinicus Boulenger.*

|                                | mm.  |
|--------------------------------|------|
| Length, snout to vent          | 76   |
| Length of head                 | 21   |
| Width of head                  | 26   |
| Diameter of eye                | 8.5  |
| Diameter of tympanum           | 6.1  |
| Length of snout                | 9    |
| Depth of head, in front of eye | 9    |
| Depth of head, at tympanum     | 11.5 |
| Length of parotoid             | 13   |
| Width of parotoid              | 7    |
| Foreleg                        | 43   |
| Longest finger                 | 15   |
| Hind leg                       | 80   |
| Femur                          | 26   |
| Tibia                          | 25   |
| Foot                           | 35.5 |
| Longest toe                    | 22   |

*Variation.*—There are three adult specimens of this species in the Bureau of Science collection, two of which were taken from the stomachs of *Boiga dendrophila* Boie, a snake from Palawan.

In one of the specimens the occipital ridges are higher and blunter than in the one described. In a Balabac specimen, which is about half grown, the low ridge following the canthus rostralis and that between the eyes form a distinct angle at the anterior corner of the eye and then a second angle is formed at the union of the occipital ridge with the interorbital ridge; the connection between the supratympanic ridge and the occipital ridge behind the eye is very indistinct; the parotoid gland is as long as its distance to the anterior corner of the eye. The specimen is a male, showing the internal openings to the vocal sacs. There is a rather distinct skin fold from the parotoid back toward the groin, surmounted by rather large tubercles, which is only dimly evident in the specimen described, where the markings are indistinct, and the limbs dimly barred.

A young specimen from northern Palawan (42 millimeters) has distinct markings, but the cranial ridges are dim or wanting. As shown by my specimens, the cranial ridges are variable in arrangement and distinctness and the relative length of limb and body varies.

Specimens collected by myself were found along streams in the low mountains of northern Palawan and Busuanga, during rain storms. The type was collected at Puerto Princesa in Palawan by A. Everett.

#### PELOBATIDÆ

Upper jaw toothed; vomerine teeth frequently present; diapophyses of sacral vertebra strongly dilated; terminal phalanges simple; vertebræ procœlous or opisthocœlous; pupil vertical.

The family is widely distributed, but has comparatively few species. It is found in Europe, India, Malaysia, and central North America. Only one genus, *Megalophrys*, has been recognized in the Philippine fauna.

#### Genus MEGALOPHRYS Kuhl

*Megalophrys* KUHL, Bull. Sc. Nat. 2 (1824) 83; WAGLER, Syst. Amph. (1830) 204; TSCHUDI, Class. Batr. (1838) 82; DUMÉRIL and BIBRON, Erp. Gén. 8 (1841) 456; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 36; COPE, Nat. Hist. Rev. (1865) 107; Journ. Acad. Nat. Sci. Philadelphia II 6 (1866) 80; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 442.

- Ceratophryne* GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 136.  
*Leptobrachium* TSCHUDI, Class. Batr. (1838) 81; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 36; COPE, Nat. Hist. Rev. (1865) 107; Journ. Acad. Nat. Sci. Philadelphia II 6 (1866) 80; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 440; Fauna Brit. India, Rept. (1890) 510.  
*Xenophrys* GÜNTHER, Rept. Brit. India (1864) 414; COPE, Nat. Hist. Rev. (1865) 107; Journ. Acad. Nat. Sci. Philadelphia II 6 (1866) 80; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 441.

"Pupil erect. Tongue circular or pyriform, entire or nicked and free behind. Vomerine teeth in two small groups, if present. Tympanum distinct or hidden under the skin. Fingers free, toes free or shortly webbed; outer metatarsals united. Sternum with a bony style. Coccyx, if distinct from the sacral vertebra, with simple articulation." (*Boulenger.*)

*Key to the Philippine species of Megalophrys Kuhl.*

- a*<sup>1</sup>. Eyelid with dermal spine.  
*b*<sup>1</sup>. Males with an internal vocal sac; without vomerine teeth.  
*M. stejnegeri* Taylor (p. 148).  
*b*<sup>2</sup>. Males with vocal sac; vomerine teeth present.  
*M. ligayæ* Taylor (p. 151).  
*b*<sup>3</sup>. Males without vocal sac; vomerine teeth present.  
*M. montana* (Kuhl)\* (p. 153).  
*a*<sup>2</sup>. Eyelid without dermal spine; no vomerine teeth; males with vocal sac.  
*M. hasselti* (Tschudi) (p. 155).

The genus has been admirably reviewed by Boulenger;† he has included figures of six species. The species of the genus are confined to southeastern Asia, the Malayan Archipelago, and the Philippines. Whether three or four species should be included in the Philippine fauna is still a question. Before this can be considered settled, a reëxamination of Philippine specimens in European museums referred to *M. montana* will be necessary. I include that species as doubtfully belonging to our fauna.

**MEGALOPHRYS STEJNEGERI** Taylor

PLATE 10, FIGS. 1 AND 1a

*Megalophrys stejnegeri* TAYLOR, Philip. Journ. Sci. 16 (1920) 347.

*Type*.—No. F315, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August 10, 1912, by E. H. Taylor.

*Description of type*.—Vomerine teeth wanting; choanæ large, concealed by the overhanging jaw, bounded behind by the bony palatal ridge, the distance between them less than the distance between nostrils; tongue entire without evidence of a nick; (males with vocal sac); head very large, about one and one-half

\* Doubtfully of Philippine occurrence.

† Proc. Zool. Soc. London 1 (1908) 410.

times as long as broad; eyes large, prominent, their diameter distinctly longer than the length of snout; distance between nostrils greater than their distance from eyes; canthus rostralis distinct, angular; loreal region vertical, somewhat concave; snout small, truncate, projecting over lower jaw with a small tubercular tip; nostril much nearer tip of snout than eye; tympanum irregularly oval, rather indistinct, separated from eye by a distance equal to much more than greatest diameter of tympanum; jaw semicircular in outline, almost hidden when viewed from above; a bonelike ridge from eye to above tympanum; interorbital space little more than one and one-half times the width of upper eyelid (exclusive of horn), its greatest diameter from one-half to two-thirds that of eye; skin of body rather smooth with folds and occasional, irregular tubercles; skin of occiput rather involved in the cranial ossification; a distinct dermal spine, or horn, points outward from the middle of outer edge of upper eyelid, its length a little more than half the width of eyelid; upper eyelid granular; a skin fold follows the bony ridge above tympanum, and continues back and down to near arm; a small dermal spine at angle of jaw; an enlarged, more or less distinct, short glandular fold above insertion of arm; a distinct transverse fold behind head; two dorsolateral skin folds reaching a little more than two-thirds the distance to end of body, and beginning behind the skin fold that delineates the head; breast with two mammalike rounded tubercles, one on either side; skin on chin smooth; belly with scattered blunt tubercles; hind limbs with dim, narrow, transverse granular folds; no tarsal fold; fingers very slightly swollen at tips; first finger slightly shorter than second; second and fourth of nearly equal length; subarticular tubercles very indistinct, forming more or less continuous longitudinal ridges; a dim tubercle at base of first finger; toes slightly dilated at tip, with a mere rudiment of web at base; subarticular tubercles wanting or indistinct; a large, flat, prominent inner metatarsal tubercle; no outer tubercle; tibiotarsal articulation reaches halfway between eye and tympanum.

*Color in life.*—Above olive brown, anterior part of head slightly lighter than back; a dim, angular, lighter stripe across head; indistinct mottling on head and back; sides with occasional tubercles, usually of darker color, but yellow tipped; a canthal black streak; upper lip mottled brown, a brownish area below eye involving a distinct black spot behind eye; arm strongly barred with dark brown; fingers also barred; hind leg and foot barred brown; chin dusky brown spotted with darker, and with

two dim, longitudinal, lighter yellowish lines; two yellow spots on breast; belly yellowish with brown mottlings.

*Measurements of Megalophrys stejnegeri Taylor.*

|                          | mm.  |
|--------------------------|------|
| Length, snout to vent    | 64   |
| Length of head, from jaw | 21   |
| Width of head            | 30   |
| Eye to tip of snout      | 8    |
| Diameter of eye          | 9    |
| Diameter of tympanum     | 4.5  |
| Interorbital distance    | 9.2  |
| Foreleg                  | 39   |
| Longest finger           | 15.5 |
| Hind leg                 | 86.5 |
| Femur                    | 27   |
| Tibia                    | 23.5 |
| Foot                     | 37   |
| Longest finger           | 22   |

*Variation.*—This species, like *Megalophrys montana*, is variable in many characters. In Mindanao specimens the fingers vary in length. Sometimes the first, second, and fourth fingers are equal, and sometimes they vary progressively in length, but in none of the specimens is the difference great; the nostrils are much nearer tip of snout than eye; the tympanum is not clearly outlined, and is frequently somewhat triangular in shape, with or without a narrow, fairly distinct ridge bounding it in front; the vomerine teeth are constantly absent in the series at hand; a semicircular skin fold is frequently present in the middle of the back, arched forward; in some specimens the tongue has a small nick behind; the males have vocal sacs. The markings vary, chiefly in intensity; the black mark behind and somewhat below eye is invariably present. In younger specimens there are two rather distinctly defined cranial ridges running back from a point where the anterior part of eye meets the canthus. These are not visible in the type, which is probably a full-grown female. The yellow tubercles on the posterior side of femur are distinct in some specimens and dim in others.

*Remarks.*—*Megalophrys stejnegeri* is clearly differentiated from *M. montana* (Kuhl), to which it is closely related, by the presence of vocal sacs in the male. The slits are large and distinctly visible on either side of the posterior part of tongue near angle of jaws. The male has a loud "croak" which, during the breeding season, can be heard for a considerable distance. Nearly all the specimens were discovered by hearing the "croak." During a rain they usually come out of their hiding places. All the specimens captured were taken in low mountains

or hills, at elevations not exceeding 300 meters. The tadpoles were taken in small mountain streams, but the specimens preserved were lost. I suspect that many of the Philippine specimens that have been reported as *Megalophrys montana* were really *M. stejnegeri*. Boulenger has reported *M. montana* from Dinagat\* and Samar;† F. Müller‡ and I. G. Fischer§ both report it from Mindanao.

If the specimens taken were young, or females, the vocal sacs may have been overlooked. It is possible, of course, that two species occur in one locality. In view of this possibility I include Boulenger's description of *Megalophrys montana* (Kuhl).

#### MEGALOPHRYS LIGAYÆ Taylor

PLATE 10, FIGS. 2 AND 2a

*Megalophrys ligayæ* TAYLOR, Philip. Journ. Sci. 16 (1920) 350.

*Type*.—No. F325, E. H. Taylor collection; collected in northern Palawan, May, 1918, by Victor Lednicky.

*Description of type*.—Vomerine teeth in two strong rounded groups lying between the posterior part of choanæ, separated from each other by a distance equal to one and one-half times the length of a single group; separated from choanæ by a distance about half the length of a single group; choanæ not concealed by overhanging jaw; the distance between the Eustachian tubes distinctly greater than their distance from choanæ; distance between choanæ a little less than distance between nostrils; males with vocal sacs, the openings rather elongate slits; openings distinct, about halfway from posterior part of tongue and angle of mouth; tongue rounded, with a distinct nick behind; head much broader than long; snout rather distinctly pointed in front; eye large, its diameter distinctly less than length of snout; nostril halfway between eye and tip of snout, or slightly nearer tip; tympanum moderately distinct, its greatest length about two-thirds of diameter of eye; separated from eye by a distance nearly one and a half times its greatest length; width of eyelid (exclusive of spine) contained one and one-half times in inter-orbital distance; skin with minute spicules, with larger tubercles on back, sides, and limbs; belly smooth; a short dermal spine on edge of upper eyelid; a distinct fold from eye to above arm; two slightly diverging dorsolateral folds beginning in the occipital region and continuing half the length of body; a rather

\* Cat. Batr. Sal. Brit. Mus. ed 2 (1882) 442.

† Proc. Zool. Soc. London 1 (1908) 413.

‡ III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 11.

§ Jahrb. wiss. Anst. Hamburg 2 (1885) 80.

short dermal spine at angle of mouth; prominent glandular tubercle above insertion of arm, on each shoulder, and in middle of back; several scattered tubercles on back and on upper side of thigh; two prominent glandular mammalike tubercles on breast; skin on head involved in cranial ossification; first finger about as long as second, both extending farther than fourth, tips swollen slightly into blunt disks without grooves; subarticular tubercles not distinct; a rather large swelling at base of first finger; toes apparently entirely free; third distinctly longer than fifth; a large inner metatarsal tubercle as long as first toe; no tarsal fold; hind leg brought forward, the tibiotarsal articulation reaches anterior edge of tympanum.

*Color in life.*—Above olive gray; a backward curved line across head limits the dark occipital area, which continues backward between the dorsolateral folds to end of body; a narrow black line follows the outer side of the dorsolateral folds some distance; most of the tubercles on back dense black; numerous dark flecks scattered through the ground color; an elongate black spot above insertion of arms; outer edge of upper eyelid and spine black; a black loreal stripe and a narrow, black, yellow-edged line below eye, ending in a black spot behind eye; tip of snout dark; upper lip with elongate, yellow-edged spots confluent with those on lower jaw; limbs with very dim bars above; below, throat brownish with islandlike, yellow-edged spots; belly and underside of hind limbs yellow, with brownish spots; distinct black spots on underside of fore limbs; breast tubercles yellow, as are also the tips of the dermal spines on eye and angle of jaw; heel and foot with black spots.

*Measurements of Megalophrys ligayæ Taylor.*

|                                 | mm. |
|---------------------------------|-----|
| Length, snout to vent           | 60  |
| Length of head, to angle of jaw | 23  |
| Width of head, at tympanum      | 29  |
| Diameter of eye                 | 7.1 |
| Diameter of tympanum            | 4.8 |
| Eye to nostril                  | 4.1 |
| Length of snout                 | 9   |
| Tympanum from eye               | 7   |
| Interorbital distance           | 9   |
| Eyelid                          | 6   |
| Foreleg                         | 37  |
| Longest finger                  | 15  |
| Hind leg                        | 74  |
| Femur                           | 25  |
| Tibia                           | 18  |
| Foot (entire)                   | 31  |
| Longest toe                     | 20  |

*Variation.*—This specimen was collected in Palawan by Victor E. Lednicky. It differs but little from several younger specimens collected by myself in Palawan, now a part of the Bureau of Science collection. A young specimen, which still has a bud of a tail, measures only 13 millimeters in length from snout to vent; the hind legs measure 15 millimeters. It is dark above, throat and chest entirely black, hind legs whitish; tubercles on posterior part of back arranged in a broad V-shaped series, only dimly noticeable in the type. The vomerine teeth are visible in all save the very young specimens.

*Remarks.*—This species, like *Megalophrys stejneri*, differs from *M. montana* in that it has vocal sacs. From *M. stejneri* it differs in that it has vomerine teeth, unconcealed choanæ, a longer and more-pointed snout, smaller eyes, a larger and more-distinct tympanum, a flatter head, and a shorter spine above eye. It also differs in color and markings.

The species is rather common in mountain streams. I strongly suspect that specimens from Palawan, collected by Everett and reported by Boulenger,\* belong to this species. I did not find the tadpoles of this species.

The species is named for Macario Ligaya, the Filipino artist whose careful drawing has contributed much to the value of this paper.

#### MEGALOPHRYS MONTANA (Kuhl) †

*Megophrys monticola* KUHLE, Isis (1822) 475.

*Megalophrys montana* KUHLE in Ferussac, Bull. Sci. Nat. 2 (1824) 83; WAGLER, Syst. Amph. (1830) 204; TSCHUDI, Class. Batr. (1838) 82; DUMÉRIEUX and BIBRON, Erp. Gén. 8 (1841) 458; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 36; Ann. & Mag. Nat. Hist. IV 11 (1873) 419; BOULENGER, Cat. Batr. Sal. Brit. Mus. ed. 2 (1882) 442; Proc. Zool. Soc. London 1 (1908) 411; F. MÜLLER, ‡ III. Nacht. Cat. Herp. Samml. Basel Mus. (1887) 11; FISCHER, ‡ Jahrb. Wiss. Anst. Hamburg 2 (1885) 80; BOETTGER, ‡ Ber. Senck. Nat. Ges. (1886) 125; WEBER, Ann. Jard. Bot. Buitenzorg 15 (1898) suppl. 2, 5; LAIDLAW, Proc. Zool. Soc. London (1900) 889; ANNANDALE, Fasc. Mal. Zool. 2 (1903) 275; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 77, pl. 7, fig. 30.

*Ceratophrys montana* GRAVENHORST, Delic. Mus. Zool. Vratislav. (1829) 47; SCHLEGEL, Abbild. (1837) 29, pl. 10, fig. 3.

*Ceratophryne montana* SCHLEGEL, Handl. Dierk. 2 (1858) 57.

\* Ann. & Mag. Nat. Hist. VI 14 (1894) 87.

† Doubtfully included.

‡ It is possible, but not certain, that these references should be relegated to the synonymy of *Megalophrys stejneri* Taylor and *M. ligayæ* Taylor which differ from *M. montana* in the presence of a vocal sac.

*Megalophrys montana* GÜNTHER, Rept. Brit. India (1864) 413, part.  
*Megalophrys montana* var. *aceras* BOULENGER, in Annandale and Robinson, Fasc. Mal. Zool. (1903) 131, pl. 5, fig. 1.

*Description of species.*—(From Boulenger.)\* “Tongue entire or feebly nicked behind. Vomerine teeth usually present, in two widely separated small groups just behind the level of the choanæ. Head large,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times as broad as long, usually defined behind by a more or less distinct transverse fold; snout truncate or obtusely pointed, projecting beyond lower jaw, as long as or a little shorter than eye; canthus rostralis sharp; loreal region vertical or a little oblique, concave; nostril equally distant from eye and from end of snout; interorbital space concave, its width  $1\frac{1}{2}$  to 2 times that of upper eyelid (narrower in the very young); tympanum usually feebly distinct, rarely hidden, its diameter  $\frac{1}{2}$  to  $\frac{3}{4}$  that of eye, from which it is separated by a distance equal to the diameter of the latter. Fingers obtuse or feebly swollen at the end, first as long as or a little longer than second, which measures  $\frac{2}{3}$  to  $\frac{3}{4}$  length of third; no subarticular tubercles; no distinct metacarpal tubercles. Toes rather short, obtuse or feebly swollen at the end, with a mere rudiment of web or, at most,  $\frac{1}{4}$  webbed; no subarticular tubercles; a flat, very indistinct inner metatarsal tubercle. Tibiotarsal articulation reaching the shoulder, the commissure of the jaws, or the temple; tibia  $\frac{3}{8}$  to  $\frac{1}{2}$  length from snout to vent; foot as long as or shorter than tibia. Skin of upper parts smooth or with scattered conical warts, old specimens with bony deposits on the head and anterior part of the back; a strong glandular fold from eye to shoulder, usually another on each side of the back; upper eyelid with a sharp, raised edge, which is produced into a more or less distinct point or ‘horn,’ this point may be very indistinct (var. *aceras* Blgr.), or very much developed, measuring nearly  $\frac{2}{3}$  diameter of eye; as a rule it does not measure more than  $\frac{1}{2}$  diameter of eye; an indication of a similar appendage on the tip of the snout rarely present;† a more or less developed pointed tubercle usually present behind the commissure of the jaws; limbs usually with oblique transverse glandular ridges; throat smooth, belly with small tubercles.

*Color.*—“Olive-brown above, uniform or variously marked with darker or lighter; a more or less distinct large triangular dark spot between the eyes, the base forwards, and a dark oblique bar below the eye; limbs with more or less distinct dark cross-

\* Proc. Zool. Soc. London 1 (1908) 411.

† “\* In a specimen from Java, where the species is most abundant.”

bars; lower parts pale brown, spotted or marbled with darker; a white tubercle on each side of the breast. Male without vocal sac."

*Measurements of Megalophrys montana (Kuhl).*

|                                   | Male.<br>mm. | Female.<br>mm. |
|-----------------------------------|--------------|----------------|
| Length, snout to vent             | 55           | 88             |
| Length of head, to occiput        | 19           | 27             |
| Width of head                     | 29           | 43             |
| Length of snout                   | 6            | 8              |
| Diameter of eye                   | 6            | 8              |
| Interorbital width                | 10           | 14             |
| Diameter of tympanum              | 4            | 4              |
| Distance between eye and tympanum | 6            | 9              |
| Foreleg                           | 35           | 53             |
| Hand                              | 16           | 23             |
| Hind leg                          | 70           | 110            |
| Tibia                             | 23           | 35             |
| Foot                              | 21           | 35             |

*Remarks.*—"It is a sluggish and thoroughly nocturnal animal. Nothing has been observed concerning its breeding-habits; but I find the eggs to be large, those in the oviduct of a specimen 83 millim. long measuring 3 millim. in diameter. \* \* \* tadpoles are found in mountain streams with gravelly beds and are remarkable for the funnel-like float formed by the lips, which are beset with minute horny teeth; these are not connected in any way with definite ridges or lamellæ, but radiate along the anterior surface of the funnel. According to Annandale, the funnel-shaped lip is capable of assuming two very distinct forms, according to the position of the tadpole:—(1) When the animal is hanging from the surface-film, as it frequently does, this structure becomes a translucent rhomboidal or lozenge-shaped float, depressed in the center towards the mouth, but otherwise nearly flat; (2) when, on the other hand, the animal is resting on the bottom, the float takes on the appearance of a pair of slender processes, continued upwards on the sides, like a pair of horns. As in other Pelobatidæ, the spiraculum is sinistral. The tail is more than twice as long as the body, the total length of the largest tadpole being about 40 millim. The coloration is of a very dark brown, even on the belly." (*Boulenger.*)

MEGALOPHRYS HASSELTII (Tschudi)

PLATE 8, FIGS. 4 AND 4a

*Leptobrachium hasseltii* TSCHUDI, Class. Batr. (1838) 81; GÜNTHER, Cat. Batr. Sal. Brit. Mus. (1858) 36; BOULENGER, Cat. Batr. (1881) 441; Zool. Rec. (1885), Rept. 24; Proc. Zool. Soc. London (1890)

- 37; Fauna Brit. India, Rept. (1890) 511; ISENSCHMID, Mitth. Nat. Ges. Bern (1903) 20; VAN KAMPEN, Zool. Jahrb. Syst. 22 (1905) 712.  
*Rana hasseltii* SCHLEGEL, Handl. Dierk. (1858) 56, pl. 4, fig. 71.  
*Megalophrys hasselti* BOULENGER, Proc. Zool. Soc. London 1 (1908) 425.

*Description of species.*—(From Boulenger, Proc. Zool. Soc. London, 1908.) "Tongue nicked behind. Vomerine teeth absent. Head large, about once and  $\frac{1}{4}$  as broad as long; snout rounded, not projecting beyond lower jaw, about as long as orbit; canthus rostralis distinct; loreal region very oblique, concave; nostril a little nearer end of snout than eye; interorbital space a little broader than upper eyelid; tympanum hidden or feebly distinct, its diameter  $\frac{1}{2}$  to  $\frac{2}{3}$  that of eye, from which it is separated by a space less than its own diameter. Fingers obtuse, not swollen at the end, first and second equal or first the longer, third nearly twice as long as second; subarticular tubercles, if distinct, irregular in their disposition; two moderately large carpal tubercles, inner a little larger than outer. Toes short, obtuse, like the fingers, webbed at the base in females,  $\frac{1}{4}$  to  $\frac{1}{2}$  webbed in males; third toe not reaching beyond base of antepenultimate phalanx of fourth; subarticular tubercles sometimes distinct, sometimes more or less confluent into an obtuse ridge; inner metatarsal tubercle small, oval, feebly prominent. Tibio-tarsal articulation reaching the shoulder; tibia  $\frac{1}{3}$  to  $\frac{2}{5}$  length from snout to vent; foot as long as head. Skin smooth or with small tubercles above, granular on belly; a glandular fold from eye to shoulder."

*Measurements of Megalophrys hasselti (Tschudi).*

|                                   | Male.<br>mm. | Female.<br>mm. |
|-----------------------------------|--------------|----------------|
| From snout to vent                | 47           | 74             |
| Length of head, to occiput        | 16           | 23             |
| Width of head                     | 20           | 31             |
| Length of snout                   | 6            | 10             |
| Diameter of eye                   | 5            | 9              |
| Interorbital width                | 6            | 10             |
| Diameter of tympanum              | 3            | 6              |
| Distance between eye and tympanum | 2            | 4              |
| Foreleg                           | 33           | 50             |
| Hand                              | 11           | 16             |
| Hind leg                          | 53           | 79             |
| Tibia                             | 16           | 24             |
| Foot                              | 15           | 23             |

*Color.*—"Brown, grey, or pale olive above, with small or large dark brown spots or marblings, which may be irregular or form a symmetrical pattern; a more or less distinct dark canthal

and temporal streak; sides of snout with dark vertical bars; limbs with dark cross-bars; throat and belly dirty white, or brown speckled with white. Male with an internal vocal sac.

"The larva has been first noticed by me, from specimens from Sumatra and Perak, and others have since been obtained in Selangor by Mr. Butler, and in Perak by Dr. Hanitsch. These tadpoles are of the same type as the typical Pelobatids of Europe, but remarkable in being marked all over with numerous deep black dots or round spots. No observations have been made on the breeding-habits, but it is probable that the eggs are laid in the water, being similar to those of *Pelobates*. Eggs from the oviducts of a female 65 millim. long measure 2 millim. in diameter.

"Mr. A. L. Butler observes (Journ. Bombay N. H. Soc. xv. 1904, p. 397) that the larval period of existence is very prolonged, and that the tail does not disappear until the size of about 40 millim. (from snout to vent) is attained."

## PHILIPPINE TURTLES

### INTRODUCTION

As compared with Borneo, Java, Sumatra, or Japan, the Philippine Islands are not rich in either genera or species of terrestrial turtles. In fact, only three genera, represented by four species, are positively known; these are *Cyclemys*, *Heosemys*, and *Pelochelys*. Several species representative of other genera have been reported, but there appears to be no specimen to substantiate any of the records. Borneo has representatives of nine genera and about fifteen species; Java, seven genera and nine species; Sumatra, ten genera and thirteen species; Japan and Formosa, six genera and seven species. On the other hand, only two genera and two species are known from Celebes.

One new species, *Heosemys leytensis*, from the southern part of Leyte, is described in this paper. Two specimens were collected there by Gregorio Lopez, together with other turtles to be used for dissecting in the zoölogical department of the University of the Philippines. He obtained forty specimens belonging to three species; namely, *Cyclemys dhor*, *C. amboinensis*, and *Heosemys leytensis*. It would appear that these land turtles are plentiful in that locality. In most localities they are rare; in collecting during seven years I have found less than a half dozen specimens, all of which belonged to *Cyclemys amboinensis*.

According to Manobo accounts a large turtle with a hard shell occurs in Agusan River. Rewards offered for specimens failed to bring forth this turtle; nevertheless, it is extremely probable that some species of aquatic turtle is present in Agusan River.

The small land turtles already mentioned are seemingly of small economic value. They feed on insects, fruit, what flesh they can find, and sometimes on plants. I do not know that these turtles are ever eaten by man.

The soft-shelled turtle, which occurs in Luzon and very probably in other large islands, is very rare. This is eaten when found, but the number taken is probably so small that its economic food value is scarcely worthy of mention. Individuals of this species are said to attain nearly a meter in length.

Four species of marine turtles are known from Philippine seas. All of these are widely distributed in the Pacific Ocean,

the Indian Ocean, and the tropical waters bordering these. The identity of these turtles is in doubt. Boulenger \* has lumped many of the names, not differentiating between Pacific and Atlantic species. Stejneger and Garman, on the other hand, recognize the Pacific species as distinct from those in the Atlantic. My treatment of this group is of a preliminary and superficial nature. An examination of numerous carapaces of the green turtle shows three different forms and colors of the shells; but without head, legs, and plastron it is futile to generalize or to attempt a separation of the varieties.

## HISTORICAL

One of the earlier writers on the Philippines says:

There are also very large sea turtles in all the islands. Their shells are utilized by the natives, and sold as an article of commerce to the Chinese and Portuguese, and other nations who go after them and esteem them highly, because of the beautiful things made from them.†

Other writers say:

The fisheries of fine-shelled turtles are also abundant, and they also form a conspicuous product. Some of the shells have markings as deep red as a fine garnet; and the four principal shells are of an extraordinary size.‡

In this land are very many turtles, of great size; they are larger than a shield. Here is a marvellous thing: when the male and the female have intercourse, they remain thus joined together for twenty or twenty-five days. They become so stupefied during this act that the Indians dive into the sea, and tie the feet of the turtles without their perceiving it, and draw these creatures ashore. I have even done this myself.§

He went in quest of the father, and carried him as a gift a turtle, the shell of which required two men to lift it—so monstrous in size are the turtles in those seas; some of them I have seen and eaten.||

Eschscholtz appears to have been the first writer actually to identify a Philippine turtle. He published in his Atlas in 1835 a drawing of a turtle from Manila Bay under the name *Chelonia olivacea*. Only a few other writers have recorded species of turtles from the Philippine Islands.

\* Cat. Chel. Rhyn. Croc. Brit. Mus. (1889).

† Morga's Sucesos (1609). From Blair and Robertson, *The Philippine Islands*. The Arthur H. Clark Company, Cleveland, Ohio 16 (1904) 103.

‡ Early Recollect Missions (1624). Translated by Blair and Robertson, op. cit. 21 (1905) 308.

§ Relation of the Filipinas Islands, Miguel de Loarca. Translated by Blair and Robertson, op. cit. 5 (1903) 167.

|| Chirino's Relation. Translated by Blair and Robertson, op. cit. 13 (1904) 211.

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Lists *Cuora amboinensis* Daudin [= *Cyclemys amboinensis* (Daudin)], *Chitra Indica cumingi* Gray (= *Pelochelys cantorii*), and three marine turtles belonging to the Cheloniidæ.
- BOETTGER, OSKAR. Ber. Senck. Nat. Ges. (1890) 34.  
Lists *Pelochelys cantorii* from the Philippines.
- BOETTGER, OSKAR. Ber. Senck. Nat. Ges. (1890) 43.  
Lists *Cyclemys amboinensis* from the Philippines.
- BOETTGER, OSKAR. Herpetologische Kenntniss der Calamianen Philippinische Inseln. Abh. Ber. König. Zool. Anthr. Eth. Mus. Dresden 7 (1894-95) 1-6.  
Lists *Cyclemys amboinensis* Daudin from Mindoro.
- BOULENGER, GEORGE ALBERT. On the herpetological fauna of Palawan and Balabac. Ann. & Mag. Nat. Hist. VI 14 (1884) 81-90.  
Lists *Cyclemys dhor* Gray from Palawan and Balabac.
- BOULENGER, GEORGE ALBERT. Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (1889) 1-311, pls. 1-6.  
Lists a few Philippine specimens.
- CASTO DE ELERA. Catálogo sistemático de toda la Fauna de Filipinas conocida hasta el presente, etc. Manila. Vertebrados 1 (1895) 399-407.  
Lists *Dermochelys coriacea* Linnæus, *Platysternum megacephalum*, *Callagur picta* Gray, *Ocadia sinensis* Gray, *Damonia reevesii* Gray, *Bellia crassicola* Gray, *Nicoria spengleri* Gray, *Cyclemys trifasciata* Gray, *C. amboinensis* Daudin, *C. flavomarginata* Gray, *C. platynota* Gray, *Chelone mydas* Linnæus, *C. imbricata* Strauch, *Thalassochelys caretta* Linnæus, *Trionyx subplanus* Geoffroy, *T. sinensis* Wiegmann, *Pelochelys cantorii* Gray, and *Chitra indica* Gray. Some of these species, certainly *Cyclemys amboinensis*, *Pelochelys cantorii*, and the four sea turtles, occur in the Islands; but I do not know of authentic preserved specimens of the other species here listed.
- DE ROOIJ, NELLIE. Reptiles of the Indo-Australian Archipelago 1 (1915) 283-332 (turtles).  
Most of the species listed by Casto de Elera are also attributed to the Philippine Islands by de Rooij.
- GRAY, JOHN EDWARD. Catalogue of the Tortoises, Crocodiles and Amphibians in the collection of the British Museum, London (1844).  
The following species are attributed to the Philippines: *Caouana olivacea* (= *Chelonia olivacea* Eschscholtz), *Chitra indica* Gray (= *Pelochelys cantorii*), *Testudo stellatus* var. (= *Testudo elegans* Gray), *Cistudo amboinensis* Gray (= *Cyclemys amboinensis* (Gray)). *Testudo stellatus* is a doubtful record. Boulenger does not recognize it.\*

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\* There is a carapace in the Santo Tomás collection belonging to a species of *Testudo*, and there is a living specimen in the Mehan Gardens in Manila. Very probably these are not Philippine specimens.

GÜNTHER, ALBERT. List of mammals, reptiles and batrachians sent by Mr. Everett from the Philippine Islands. Proc. Zool. Soc. London (1879) 74-79.

Records *Cuora amboinensis* (= *Cyclemys amboinensis* Daudin) from Dinagat.

SIEBENROCK, F. Synopsis der rezenten Schildkröten. Zool. Jahrb. Suppl. 10 (1909) 427-618.

Attributes a number of species to the Philippine Islands, probably on the strength of Casto de Elera's records.

#### ECONOMIC IMPORTANCE OF TURTLES

The sea turtles are of distinct economic importance to the Philippines, the export of the shell amounting to several thousand pesos annually. During the fiscal year 1909 the export of tortoise shell reached 2,040 kilograms valued at 34,942 pesos.

The tortoise shell of commerce consists of the hard, bony plates taken from the carapace of the hawksbill turtle *Eretmochelys imbricata* (Pennant). The two largest costals are the most valuable, as they are thicker and heavier than the other shields.

Practically all the Philippine tortoise-shell is brought into the market by native fishermen. Now, while a small number of these turtles is captured by fair means, with hook, net, spear, or trap, by far the greater number is taken when they come ashore to deposit their eggs. The fishermen are so eager to secure their prizes that as a rule they do not give the poor turtle a chance to deposit her eggs before they kill her. This short-sighted policy eventually will result in the destruction of the fisheries unless the turtles are protected during the breeding season, which is from May to August. The turtle fishermen go to small, uninhabited islands, frequently many miles from the large islands surrounding the Sulu Sea, and wait perhaps days for the turtles to come ashore to deposit their eggs. If the men are in no especial hurry they may wait until the turtle has deposited her eggs, which sometimes are 150 to 200 in number, and about the size of hens' eggs, with tough leathery shells. The fishermen then kill her before she can reach the water, and dig up the eggs which they use as food. The islands of Bancoran, Lumbucan, Arena, Cavilli, and others in the Sulu Sea, are well-known nesting places of the turtle, and it is only necessary to visit these islands to see the destruction wrought during the nesting period.

The best method of removing the tortoise-shell from the back of the turtle is to immerse the back in boiling water until the shell loosens; another method is to bury the body in the sand for eight days, when the shell becomes loosened; still another is to hold the shell over a slow fire until loosened. This latter process usually is employed. In some countries the live animal is held over the fire until the shell is loosened; it is then turned loose "to grow another shell." This method is barbarous, not only for its cruelty but also for its lack of utility, for the animal promptly dies.

The methods employed in the working of tortoise-shell are quite similar to those used in working horn. As a matter of fact, horn frequently is used as an imitation of tortoise-shell. Slow heat or steam is employed, the shell becoming plastic by immersion in water of 90°C. for two minutes. When cool, it retains any shape given it while hot.\*

The shell taken from the other marine turtles, *Chelonia japonica* and *Caretta olivacea*, is of little value. It is thin and its only value lies in using it for veneering and inlaying. The flesh of these two species, however, is much more frequently eaten than is that of the hawksbill. There are occasional cases recorded where persons have been poisoned by eating the flesh of these turtles. Sir J. E. Tennent† reports a case of poisoning from a specimen of *Chelonia virgata* [= *Chelonia japonica* (Thunb.)].

At certain seasons the flesh of the turtle on the southwestern coast of Ceylon is avoided as poisonous, and some lamentable instances are recorded of deaths ascribed to its use. At Pantura, to the south of Colombo, twenty-eight persons who had partaken of turtle in October, 1840, were immediately seized with sickness, after which coma supervened, and eighteen died during the night. Those who survived said there was nothing unusual in the appearance of the flesh except that it was fatter than ordinary.

In November, 1917, there occurred in the Philippines a case of poisoning, from eating the flesh of a large turtle. Fourteen deaths resulting were reported out of thirty-three cases of poisoning. The following is the official communication. It was suspected that the flesh had been poisoned by some one, but an examination of the flesh failed to reveal the presence of any known poison.

BANTAYAN, Noviembre 28, 1917.

Dr. AUGUSTO P. VILLALON,  
Oficial Sanitario del Distrito,  
Cebú, Cebú.

SEÑOR: Bajo cubierta por separado tengo el honor de remitir a V. un ejemplar de la carne de tortuga, que, según anterior comunicación ha producido 33 envenenamientos, con 14 defunciones. Hemos considerado 33 envenenamientos porque estos 33 son los únicos; que han tenido síntomas de tal.

Pero ahora estamos descubriendo otros, que sienten los síntomas después de 8 días. Felipa Espina y Cesario Espina han estado sin síntomas del envenenamiento por espacio de 8 días después de la ingestión de dicha carne, pero últimamente han tenido manifestaciones análogas a las de los fallecidos y fallecieron también después de 3 y 6 días respectivamente con gran tendencia al sueño y marcada debilidad.

\* Seale, A., Philip. Journ. Sci. § D 6 (1911) 293.

† The Natural History of Ceylon. London, Longman, Green, Longman, and Roberts (1861) 292.

Otro niño de dos años está en estado grave, pero hay esperanzas de curación.

Refiriéndome a los síntomas observados, consisten en mareos y vómitos persistentes, dolores en la garganta y los labios y somnolencia irresistible parecido al envenenamiento por la morfina. Pero lo más notable es la recidiva después de un tiempo bastante dilatado de curación. También es de notar la repentina tendencia al sueño desde el momento, que se observan las manifestaciones y aunque, al parecer, mejoran bajo los tratamientos empleados, sin embargo, vuelven otra vez a agravarse hasta que por fin fallecen.

Someto a su consideración las anteriores observaciones y puedo someterle más informes, si fuese necesario.

Muy respetuosamente,

[Fdo.] SEGUNDO ISAAC,  
Médico de Distrito Interino,  
Sección Sanitaria No. 6.

Whether or not the species is poisonous only at this season (the case reported by Tennent occurred in October) or whether the animal becomes diseased it is impossible to say.

Little is known regarding the large leatherback *Dermochelys schlegelii*. It is a very rare visitor to the Philippine coasts. I believe the specimen in the Ateneo de Manila is the only authentic Philippine specimen now preserved.

#### DISTRIBUTION OF TURTLES

The distribution of the genera of turtles occurring in southeastern Asia, Japan, and the Malay Archipelago is shown in Table 1. It is reasonable to expect that representatives of certain genera occurring in adjoining land masses will be eventually recorded from the Philippine Islands. Three of the species occurring in the Philippine Islands, *Cyclemys dhor*, *C. amboinensis*, and *Pelochelys cantorii*, are widely distributed in southeastern Asia and the Malay Archipelago. The fourth land species, *Heosemys leytensis*, is known only from Leyte.

TABLE 1.—Distribution of eastern genera of turtles.

| Genus.                     | Japan. | Philippines. | Borneo. | Sumatra. | Java. | Malay Peninsula. | Celebes. | New Guinea. | Australia. |
|----------------------------|--------|--------------|---------|----------|-------|------------------|----------|-------------|------------|
| <i>Devisia</i> .....       |        |              |         |          |       |                  |          | ×           |            |
| <i>Ocadia</i> .....        | ×      |              |         |          |       |                  |          |             |            |
| <i>Clemmys</i> .....       | ×      |              |         |          |       |                  |          |             |            |
| <i>Callagur</i> .....      |        |              | ×       |          |       | ×                |          |             |            |
| <i>Orlitia</i> .....       |        |              | ×       | ×        |       |                  |          |             |            |
| <i>Batagur</i> .....       |        |              |         | ×        |       | ×                |          |             |            |
| <i>Geoclemys</i> .....     | ×      |              |         |          | ×     | ×                |          |             |            |
| <i>Bellia</i> .....        |        |              | ×       | ×        |       | ×                |          |             |            |
| <i>Geoemyda</i> .....      | ×      |              | ×       | ×        |       |                  |          |             |            |
| <i>Heosemys</i> .....      | ×      | ×            | ×       | ×        | ×     | ×                |          |             |            |
| <i>Cyclemys</i> .....      | ×      | ×            | ×       | ×        | ×     | ×                | ×        |             |            |
| <i>Testudo</i> .....       |        |              | ×       | ×        |       | ×                | ×        |             |            |
| <i>Chelodina</i> .....     |        |              |         |          |       |                  |          | ×           |            |
| <i>Emydura</i> .....       |        |              |         |          |       |                  |          | ×           | ×          |
| <i>Carettochelys</i> ..... |        |              |         |          |       |                  |          | ×           |            |
| <i>Chelonia</i> .....      | ×      | ×            | ×       | ×        | ×     | ×                | ×        | ×           |            |
| <i>Caretta</i> .....       | ×      | ×            |         | ×        | ×     | ×                | ×        | ×           |            |
| <i>Eretmochelys</i> .....  | ×      | ×            | ×       | ×        | ×     | ×                | ×        | ×           |            |
| <i>Dermochelys</i> .....   | ×      | ×            | ×       | ×        |       | ×                |          |             |            |
| <i>Dogania</i> .....       |        |              | ×       | ×        | ×     | ×                |          |             |            |
| <i>Pelochelys</i> .....    |        | ×            | ×       | ×        |       | ×                |          | ×           |            |
| <i>Amyda</i> .....         | ×      |              | ×       | ×        | ×     | ×                |          |             |            |

## LOCAL PHILIPPINE NAMES OF TURTLES

*Antipa* (Tagalog) is *Pelochelys cantorii*.

*Bao* (Visayan) is *Cyclemys amboinensis* and *C. dhor*.

*Bayuyuco* (Tagalog) is *Cyclemys amboinensis*.

*Cala* (Tagalog) is a name applied to marine forms, especially *Eretmochelys imbricata*.

*Pagong* (Tagalog) is *Cyclemys amboinensis* and *C. dhor*.

*Paucan* (Tagalog) is a name applied to marine forms.

*Pao* (Pampanga) is *Cyclemys amboinensis*.

*Sisican* (Visayan) is *Eretmochelys imbricata*.

## CLASSIFICATION OF THE TURTLES

Stejneger's system of classification is followed in this paper.

## Class REPTILIA

*Reptilia* LAURENTI, Synops. Rept (1768) 19.

## Subclass SYNAPSIDA

*Synapsida* OSBORN, Science 17 (1903) 276.

## Order TESTUDINATA

*Testudinata* OPPEL, Ordn. Rept. (1811) 3.*Key to the Philippine suborders of Testudinata.*

- a*<sup>1</sup>. No solid carapace, the vertebræ and ribs being separated from a shell consisting of a mosaic of numerous small polygonal bony plates embedded in a leathery skin; no descending process of the parietal bone; limbs without claws..... *Athecæ* (p. 165).
- a*<sup>2</sup>. A solid carapace, of a few large symmetrical bony plates, not separated from the underlying vertebræ and ribs; parietals with descending processes; limbs with at least one claw each.
  - b*<sup>1</sup>. Body covered with horny scutes arranged differently from the bony plates beneath; epiplastra and hyoplastra in contact, not separated by entoplastron; center of last cervical and first dorsal vertebræ articulating with each other; fourth digit never with more than three phalanges; jaws covered by horny sheaths not concealed under fleshy lips..... *Laminifera* (p. 168).
  - b*<sup>2</sup>. Body covered by an undivided leathery skin without scutes; epiplastra separated by entoplastron from hyoplastra; last cervical vertebra articulating with first dorsal by zygapophyses only; fourth digit with more than three phalanges; jaws concealed under fleshy lips.  
*Chilotæ* (p. 185).

*Key to the Philippine families of turtles.\**

- a*<sup>1</sup>. Limbs clawless; skin with very numerous polygonal plates; back with five longitudinal keels or ridges (*Athecæ*).... *Dermochelidæ* (p. 165).
- a*<sup>2</sup>. Limbs with at least one claw each; skin with or without large regular plates; back, if keeled, with at most only three longitudinal keels.
  - b*<sup>1</sup>. Outer body covering a soft skin without horny plates (*Chilotæ*).  
*Trionychidæ* (p. 185).
  - b*<sup>2</sup>. Outer body covering consisting of symmetrical horny plates (*Laminifera*).
    - c*<sup>1</sup>. Limbs not paddle-shaped; four or five claws on each leg.  
*Testudinidæ* (p. 168).
    - c*<sup>2</sup>. Limbs paddle-shaped; one or two claws on each leg.  
*Chelontidæ* (p. 180).

## Suborder ATHECÆ

*Athecæ* COPE, Proc. Am. Assoc. Adv. Sci. 19 (1871) 235.

## DERMOCHELIDÆ

*Dermochelidæ* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485.

\* A species belonging to the *Platysternidæ* has been incorrectly reported from the Philippines by Casto de Elera and by Siebenrock.

Genus **DERMOCHELYS** Blainville

- Dermochelys* BLAINVILLE, Jour. de Phys. 83 (1816) 259; Bull. Soc. Philom. (1816) 119; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 7; Fauna India, Rept. (1890) 50; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485, figs. 373-376.
- Sphargis* MERREM, Tent. Syst. Amph. (1820) 19; FITZINGER, Neue Class. Rept. (1826) 5; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 559; GRAY, Cat. Tort. (1844) 51; Cat. Shield Rept. 1 (1855) 71; Suppl. Cat. Shield Rept. (1870) 119.
- Coriudo* FLEMING, Philos. Zool. 2 (1822) 271.
- Scytina* WAGLER, Isis (1828) 861.
- Dermatochelys* WAGLER, Nat. Syst. Amph. (1830) 133; STRAUCH, Chel. Stud. (1862) 58; GÜNTHER, Rept. Brit. India (1864) 55.
- Chelyra* RAFINESQUE, Atlán. Jour. 1 (1832) 64.

Dorsal shield completely bony, exoskeleton consisting of irregular, juxtaposed, mosaiclike plates. Plastral elements eight; no entoplastron; legs paddle-shaped, clawless, digits of foreleg much elongated; phalanges without condyles; beak with two triangular cusps, between three deep notches; no enlarged alveolar surface, jaws simply sharp-edged; head covered with small shields; carapace with seven keels, plastron with five.

It is extremely difficult to determine whether there is more than one species belonging to this genus. Specimens belonging to the genus are found in temperate and tropical parts of the Atlantic and Pacific Oceans and in the Indian Ocean and the Mediterranean Sea. Certain authors maintain that the Atlantic and Pacific forms are identical. Garman has separated the Atlantic and the Pacific forms and has given the name *D. schlegelii* to specimens found in the Pacific and Indian Oceans, and Stejneger follows him in the retention of this name. R. A. Philippi has described a species, *Sphargis angustata*, from Chili.\* Until it can be proved that *D. schlegelii* and *D. coriacea* are identical, I believe that Garman's name should stand for the species occurring in the western Pacific and Indian Oceans.†

\* Ann. de Univers. Mem. Cient. Lit. (1899) 102-104, 730, 2 plates.

† Garman, Bull. U. S. Nat. Mus. 25 (1884) 294, says: "However, there is only one case in which there is any doubt, that of *Sphargis*, of which specimens from the different oceans are so much alike that writers are still undecided whether there is more than one species. Certain respects in which the Pacific "Trunkbacks" differ from those of the Atlantic have induced me to separate them, distinguishing the former by the name *Sphargis schlegelii*, and the latter by that by which it is commonly known, *Sphargis coriacea*."

## DERMOCHELYS SCHLEGELII (Garman)

- Sphargis mercurialis* TEMMINCK and SCHLEGEL, Fauna Japon., Rept. (1835) 6, pl. 1; pl. 2, figs. 3-5; pl. 3; OKADA, Cat. Vert. Japan (1891) 71.
- Sphargis coriacea* BLEEKER, Natuurk. Tijds. Neder. Indië 15 (1850) 260; TICKEL, Journ. As. Soc. Bengal 4 (1862) 367; McCoy, Nat. Hist. Victoria 2 (1885) 1.
- Dermochelys coriacea* GÜNTHER, Rept. Brit. India (1864) 55; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 10; Fauna Brit. India, Rept. (1890) 50; BURNE, Proc. Zool. Soc. London 1 (1905) 291.
- Sphargis coriacea* var. *schlegelii* GARMAN, Bull. U. S. Nat. Mus. 25 (1884) 303.
- Sphargis schlegelii* GARMAN, Bull. U. S. Nat. Mus. 25 (1884) 295; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485.

*Description of species.*—Head covered with small horny plates, usually with a transverse row across snout posterior to nostrils; a rather large parietal plate and a row of elongate scales in supraocular region; scales on occipital and temporal regions small, irregular; carapace covered with small, irregular, angular shields of nearly equal size; a small supracaudal extension of carapace; five dorsal keels composed of larger quadrangular shields; two lateral keels; plastron continuous with carapace below, composed of small shields; plastron with five keels, outer keels forming an angle near axilla and continuing to anterior point of plastron; legs large, paddle-shaped; forelegs without claws, in young about as long as carapace, shorter in adult; mouth with a strong beak, with two triangular cusps between three deep notches; jaws sharply edged; alveolar region not enlarged.

*Color.*—Dark brown above, with or without yellow spots; longitudinal keels yellow in the young, and the legs bordered with yellow.

*Measurements of Dermochelys schlegelii* (Garman).\*

|                            | mm.   |
|----------------------------|-------|
| Total length               | 1,500 |
| Length of carapace         | 1,238 |
| Width of plastron          | 842   |
| Length of foreleg          | 763   |
| Length of plastron         | 1,000 |
| Length of hind leg         | 422   |
| Transverse diameter of eye | 52    |
| Length of head             | 200   |
| Width of head              | 176   |

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\* After Schlegel, Fauna Japon. (1835) 9.

*Remarks.*—This huge sea turtle, commonly known as *Sphargis coriacea*, is included here on the strength of a large stuffed specimen in the Ateneo de Manila, which was caught at Malabon, Manila Bay, and has been in the museum for a number of years. It is adult and measures more than 2 meters from head to end of carapace.

### Suborder LAMINIFERA

*Laminifera* HEMPRICH, Grundr. Naturg. (1820) 102.

### TESTUDINIDÆ

*Testudinidæ* GRAY, Ann. Phil. 10 (1825) 210.

### EMYDINÆ

*Emydinæ* GRAY, Ann. Phil. 10 (1825) 210, part.

Turtles without paddle-shaped legs, and with more than two claws on each foot.

Many genera are associated under this subfamily, and these constitute most of the species of known turtles. They are widely distributed in all temperate and tropical countries. They are terrestrial and aquatic and are both vegetable and animal feeders.

There are only two genera positively known from the Philippines; these are *Cyclemys* and *Heosemys*. Representatives of several other genera are attributed to the Philippine Islands by Casto de Elera,\* Siebenrock,† and de Rooij.‡ Among these are *Callagur*, *Bellia*, *Geöemyda*, *Ocadia*, and *Damonia*. It is not impossible that representatives of some of these genera will be found in the Philippine Islands, but I believe there are no authentic specimens preserved in any collection.

#### *Key to the Philippine genera of the Emydinæ.*

*a*<sup>1</sup>. A temporal arch; plastron not attached solidly to carapace.

*Cyclemys* Bell (p. 168).

*a*<sup>2</sup>. No temporal arch; plastron attached solidly to carapace.

*Heosemys* Stejneger (p. 177).

### Genus CYCLEMYS Bell

*Terrapene* MERREM, Tent. Syst. (1820) 27; BELL, Zool. Journ. (1825) 308, part; FITZINGER, Neue Class. Rept. (1826) 6; STRAUCH, Chel. Stud. (1862) 25.

*Kinosternon* BELL, Zool. Journ. 2 (1825) 302, part.

*Sternotherus* BELL, Zool. Journ. 2 (1825) 305, part.

\* Cat. Fauna Filipinas 1 (1895) 400, 401.

† Zool. Jahrb. Suppl. 10 (1909) 450–508.

‡ Rept. Indo-Aust. Arch. 1 (1915) 288–307.

- Emys* WAGLER, Nat. Syst. Amph. (1830) 138, part; STRAUCH, Chel. Stud. (1862) 27; Mém. Acad. Sci. St.-Pétersburg 38 (1890) 14.
- Sternotherus* WAGLER, Nat. Syst. Amph. (1830) 137.
- Cistudo* GRAY, Syst. Rept. (1831) 17, part; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 207; GRAY, Cat. Tort. (1844) 29.
- Cyclemys* BELL, Proc. Zool. Soc. London (1834) 17; GRAY, Cat. Shield Rept. 1 (1855) 42; GÜNTHER, Rept. Brit. India (1864) 15; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 22; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 128; Fauna India, Rept. (1890) 28; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 503; SIEBENROCK, Sitzb. Ak. Wiss. Wien 112 (1903) 340; Zool. Jahrb. Suppl. 10 (1909) 500; MOCQUARD, Rev. Colon. Rept. Indo-Chine 10 (1907); DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 301.
- Cuora* GRAY, Cat. Shield Rept. 1 (1855) 22; GÜNTHER, Rept. Brit. India (1864) 11; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 21.
- Pyxidea* GRAY, Proc. Zool. Soc. London (1863) 175; GÜNTHER, Rept. Brit. India (1864) 16; GRAY, Suppl. Cat. Shield Rept. (1870) 20.
- Pyxiclemys* GRAY, Proc. Zool. Soc. London (1863) 176.
- Cystoclemmys* GRAY, Suppl. Cat. Shield Rept. (1870) 20.
- Notochelys* GRAY, Suppl. Cat. Shield Rept. (1870) 21; GÜNTHER, Rept. Brit. India (1864) 17.

Head normal, with smooth leathery skin, undivided into plates or tubercles; choanæ between eyes; skull with a bony temporal arch and a broad postorbital arch; neural plates hexagonal; plastron united to carapace by a ligament, divided into two lobes, movable between hyoplastron and hypoplastron; alveolar surfaces without median ridge; entoplastron intersected by humeropectoral suture; digits webbed or nearly free; four clawed digits on hind foot, five on forefoot; tail short.

The two Philippine species, *Cyclemys amboinensis* and *C. dhor*, are widely distributed from southern and southwestern Asia throughout the Malay Archipelago. Casto de Elera also lists *Cyclemys platynota* Gray, *C. flavomarginatus* Gray, and *C. trifasciata* Gray. I have been unable to verify these records.

*Key to the Philippine species of Cyclemys.*

- a<sup>1</sup>. Plastron not completely closing shell; posterior margin of carapace serrated..... *C. dhor* Gray (p. 173).
- a<sup>2</sup>. Plastron nearly completely closing shell in adult; posterior margin of carapace not serrated..... *C. amboinensis* (Daudin) (p. 169).

**CYCLEMYS AMBOINENSIS (Daudin)**

PLATE 11, FIGS. 1 AND 2; PLATE 12, FIGS. 3 AND 4; PLATE 13, FIGS. 2 AND 3

*Testudo amboinensis* DAUDIN, Rept. 2 (1802) 309.

*Emys amboinensis* SCHWEIGGER, Prodr. (1824) 45.

*Emys couro* SCHWEIGGER, Prodr. (1824) 46; SCHLEGEL, Fauna Japon., Rept. (1833) 63.

- Terrapene amboinensis* MERREM, Tent. Syst. Amph. (1820); STRAUCH, Chel. Stud. (1862) 99; Verth. Schildkr. (1865) 47; SOWERBY and LEAR, Tort. (1872) pl. 23.
- Kinosternum amboinensis* BELL, Zool. Journ. (1825) 305.
- Terrapene bicolor* BELL, Zool. Journ. (1825) 484, pl. 16.
- Terrapene couro* FITZINGER, Neue Class. Rept. (1826) 45.
- Cistudo amboinensis* GRAY, Syn. Rept. (1831) 19; Ill. Ind. Zool. 1 (1832) pl. 57, fig. 2; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 215, pl. 15, fig. 2 (Manila); GRAY, Cat. Tort. (1844) 30 (from Philippines); GEIBEL, Zeit. f. ges. Natur. 27 (1866) 11.
- Cuora amboinensis* GRAY, Cat. Shield Rept. 1 (1855) 41; GÜNTHER, Rept. Brit. India (1864) 12, pl. 4, figs. *a*, *b*; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 21; Appendix (1872) 10; THEOBALD, Cat. Rept. Brit. India (1876) 7; GÜNTHER, Proc. Zool. Soc. London (1879) 75 (Dinagat); MÜLLER, I. Nachtr. Cat. Herp. Samml. Mus. Basel (1880) 49 (Luzon, Negros); BOETTGER, Ber. Senck. Nat. Ges. (1886) 92.
- Cyclemys amboinensis* BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 133; Fauna Brit. India, Rept. (1890) 31, fig. 10; Fascic. Mal. Zool. 1 (1903) 343; FLOWER, Proc. Zool. Soc. London (1896) 859; (1899) 614; WERNER, Zool. Jahrb. Syst. 13 (1900) 482; LAIDLAW, Proc. Zool. Soc. London 2 (1901) 582; BOETTGER, Abh. Senck. Ges. Frankfurt 25 (1901) 364; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 343; Zool. Jahrb. Suppl. 10 (1909) 503; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 302; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 143.

*Description of species*.—(From No. 1460, Bureau of Science collection; collected on Polillo, P. I., October, 1909, by C. Canonizado.) Head moderately large, completely retractile; snout bluntly pointed, nostrils anterior, very close together; eyes diagonally set; upper jaw with only slight hook, finely denticulated; top of head covered with smooth leathery skin, undivided; a very slight elevation on skull just behind eyes; carapace smooth, convex, with a single median keel, dim anteriorly, but distinct posteriorly; five vertebral shields, only third longer than wide, all narrower than costals; latter shields wider than long, four on each side; eleven marginals on each side; a small nuchal, longer than wide; supracaudals small, longer than wide, slightly notched; posterior edge of carapace not or but very slightly serrate; plastron about the size of opening of shell, only slightly pointed behind with notch in posterior part; gular shields small, longer than wide, without notch, suture between them much longer than that between humerals; transverse suture between humerals and pectorals curved, the curve convex anteriorly; pectorals as broad as long, their mutual suture as long as or a little shorter than mutual suture of abdominals; femorals broader than long, suture between them and abdominals curved, the curve convex poste-

riorly; anals longer than broad, triangular, their mutual suture as long as that between abdominals; hinge between pectorals and abdominals very flexible; sutures between pectorals and marginals about same as that between abdominals and marginals; foreleg moderately long, with five clawed digits, claws more than half the length of digits; a short web between digits; forearm with numerous broadened scales; two large scutes and two small ones on inner side of arm, four large unequal-sized scutes on underside of foreleg; bottom of foot covered with small equal-sized scales; toes covered with imbricate plates, five above longest toe; hind leg longer than foreleg, with four clawed digits; a few enlarged scutes on posterior side of leg; no large scales on upper or anterior side; a few enlarged scales on heel and numerous unequal-sized scales on foot, larger than those on forefoot; tail short, with a double series of subcaudal plates, twelve or thirteen pairs in all; exposed skin of body covered with fine tubercles.

*Color in life.*—(From a living specimen in the Bureau of Science aquarium.) Brown above, with very indistinct darker areas on back; below, marginals yellow, each with a large black area on outer posterior edge; plastral scales each with a large irregular black blotch covering about one-third of each scute; head uniform dark brown above; a broad brown stripe as wide as head continuing on neck; a yellow stripe from point of snout along canthus rostralis through upper part of orbit and across temporal region where it widens slightly; a dark brown line begins below the yellow one on point of snout, runs through eye, then widens and continues on side of neck to body; a second yellow stripe begins on snout, below the brown line, and passes through eye to ear where it is lost in the yellow of side of neck; below this a brown line crosses lower part of orbit to ear; below this another yellow line with a thin brown line below it; a brown line borders lower jaw and continues to below ear; chin and throat yellow to flesh color; a short black stripe on posterior part of neck on side; legs mottled with gray; forelegs usually with dim light stripes, continuing on toes.

*Variation.*—In the Bureau of Science collection there are three other adult specimens from Polillo and five young ones. The adults all agree in the smoothness of the carapace; in two (Nos. 1463 and 1464) the trace of the dorsal keel is almost effaced, and the anal shields are fused into a single large shield. In the specimen described they are only partially fused. In the fourth specimen (No. 1462) the two plates are distinct. This specimen has a broad regular depression along the middle of the

plastron, while in the other three the plastrons are gently convex. A specimen (No. 1475) from Laguna Province, Luzon, exhibits a partial fusion of the anal shields and only a dim trace of the dorsal keel. The amount of black on the plastron varies considerably. In certain specimens the black almost covers the entire plastron; in others it is almost wanting.

*Measurements of Cyclemys amboinensis (Daudin).*

|                             | mm. |
|-----------------------------|-----|
| Total length, head extended | 238 |
| Total length of carapace    | 158 |
| Greatest width of carapace  | 110 |
| Height of body              | 70  |
| Length of plastron          | 150 |
| Width of plastron           | 78  |
| Length of posterior lobe    | 84  |
| Length of anterior lobe     | 65  |
| Length of tail, behind anus | 20  |
| Length of head              | 38  |
| Width of head               | 24  |

*Young.*—The young differ rather markedly from the adults. A very strong, blunt keel from nuchal plate to end of last vertebral; vertebral shields distinctly wider than long, very nearly as wide as costals; two fine distinct keels passing along upper half of costals; marginals very much broader proportionally than in the adult; carapace very finely sculptured; plastron with a distinct, transverse depression across hinge; anal plates distinct, suture of abdominal plate with the marginals larger than that of pectoral with the marginals. Carapace uniform dark brown; dark color on plastron forming a single continuous figure and not reaching outer edge of scutes; dark areas at union of plastron with marginals, and dark spots on underside of marginals.

There are two other adult specimens in the Bureau of Science collection. In a living specimen in the Bureau of Science aquarium the carapace retains the three keels; the shields are roughly sculptured on the upper posterior parts and the concentric growth lines are very distinct, with a few, slight, radiating ridges. The posterior edge of the carapace is distinctly serrate and there is a distinct notch between the supracaudals; there is a small notch in the plastron between the anals. The very important character of the posterior serrations on the carapace suggests a distinct geographic race. The locality from which the specimens came is unknown.

*Remarks.*—Turtles of this species are fairly common in the Philippine Islands or at least are frequently seen, because they

are often kept as pets. The adults are often found at a considerable distance from water; the young, however, are aquatic. The species is known from Luzon, Polillo, Dinagat, and Mindanao. It ranges from southeastern Asia through the Malay Archipelago to Celebes and Amboina. The name for the species in the Visayan dialects is *baò*.

## CYCLEMYS DHOR Gray \*

PLATE 12, FIGS. 1 AND 2; PLATE 14, FIGS. 1 TO 4

- Emys dhor* GRAY, Syn. Rept. (1831) 20, part.  
*Cyclemys orbiculata* BELL, Proc. Zool. Soc. London (1834) 17; Mon. Test. (1842) pls. 24 and 25; GRAY, Proc. Zool. Soc. London (1863) 178; THEOBALD, Journ. Linn. Soc. 10 (1870) 12.  
*Emys dentata* GRAY, Ill. Ind. Zool. 2 (1834) pl. 58, fig. 2.  
*Cistudo diardii* DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 227.  
*Cistudo dentata* GRAY, Cat. Zool. (1844) 32.  
*Emys diardii* SCHLEGEL, Verli. Natuurk. Afbeeld. 44 (1849) figs. 6 and 7.  
*Cyclemys dentata* GRAY, Cat. Shield Rept. 1 (1855) 42, pl. 19; JERDON, Proc. As. Soc. Bengal (1820) 68; THEOBALD, Cat. Rept. Brit. India (1876) 8.  
*Emys dhor* STRAUCH, Chel. Stud. (1862) 28; Verth. Schildkr. (1865) 58.  
*Cyclemys oldhami* GRAY, Proc. Zool. Soc. London (1863) 178; GÜNTHER, Rept. Brit. India (1864) 15, pl. 5, fig. 6; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 23.  
*Cyclemys ovata* GRAY, Proc. Zool. Soc. London (1863) 179; Suppl. Cat. Shield Rept. 1 (1870) 23.  
*Cyclemys bellii* GRAY, Proc. Zool. Soc. London (1863) 179.  
*Cistudo orbiculata* GEIBEL, Zeits. f. ges. Natur. 27 (1866) 13.  
*Cyclemys dhor* GRAY, Suppl. Cat. Shield Rept. 1 (1870) 23; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 131; Fauna Brit. India, Rept. (1890) 30; Ann. & Mag. Nat. Hist. VI 14 (1894) 82 (Palawan); BARTLETT, Note Book Sarawak 1 (1894) 3; FLOWER, Proc. Zool. Soc. London (1899) 613; CARRUCCIO, Boll. Soc. Zool. Ital. II 1 (1900) 95; WERNER, Zool. Jahrb. Syst. 13 (1900) 482; BROWN, Proc. Acad. Nat. Sci. Philadelphia 54 (1902) 176; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 341; Zool. Jahrb. Suppl. 10 (1909) 501; MOCQUARD, Rev. Col. Paris (1907) 11; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 302.

*Description of species*.—(From a living adult specimen,† belonging to W. Schultze, Manila, P. I., collected in Palawan.) Head moderately large, completely retractile. Snout slightly peaked just above nostrils, curving in profile from nostrils to

\* Stejneger is of the opinion that the name *dentata* should be retained rather than *dhor*, see Mem. Mus. Comp. Zool. 44 (1912) 143. Gray, in his later work, chose *dhor* as the name for retention.

† I am under obligation to Mrs. W. Schultze for the privilege of describing this specimen.

mouth; nostrils anterior, very close together; upper jaw with a distinct bicuspid hook; top of head covered with smooth skin, skin in temporal region and on side of head distinctly lined and broken; a slight elevation across skull just behind eyes; head somewhat depressed in occipital region; carapace smooth, distinctly flattened on top, with an obscure keel from nuchal along median line to supracaudals, more prominent posteriorly; a slight broad depression on each side of keel; five vertebral shields, all distinctly broader than long, except first, which is as broad as long, all narrower than the three anterior costals; costals distinctly broader than long, except last, which is longer than broad; eleven marginals on each side; nuchal very small, a little longer than broad; supracaudals moderate, not or scarcely notched behind; carapace somewhat serrated on posterior border, smoothly rounded laterally and with an irregular border anteriorly; plastron about as large as opening of shell, anterior part extending a little beyond anterior edge of carapace, posterior part not extending as far as carapace; a transverse hinge between hyoplastron and hypoplastron, this hinge not corresponding to suture between pectoral and abdominal shields; however, plastron flexible on suture between pectorals and abdominal shields; gular shields triangular, their anterior edges truncate, forming a straight line, their mutual suture much longer than that between humerals; a slight but distinct notch between humerals and gulars on edge of plastron; suture between humerals and pectorals forming a wavy line; suture between pectorals and abdominals curving strongly, convex posteriorly; mutual suture of pectorals longer than that of other shields; suture of pectorals with marginals much shorter than that of abdominals with marginals; suture between abdominals and femorals curved slightly convex posteriorly; suture between anals and femorals strongly curved convex anteriorly; anals with a curved notch, their mutual suture longer than that of femorals; intercalary, axillary, and inguinal shields very small; on anterior part of humerals a trace of a straight suture corresponding to hinge; the two elements formed by the suture are entirely coalesced; anterior part of foreleg covered with irregular enlarged shields; digits five, partly webbed, all covered above with transverse scales, each equipped with a strong curved claw; forefoot with small irregular scutes on sole; on underside of foreleg only a few enlarged scutes; hind leg with four digits, each equipped with strong curved claws; hind leg with no enlarged scales except on heel; tail with eight pairs of enlarged subcaudal scales.

*Color in life.*—Above, carapace light brown, with a few darker spots and a few dim longitudinal spots along keel; plastron and marginals brownish yellow, with distinct radiating lines on each plastral shield; head brownish yellow, with small dark spots on neck with numerous lines of black and yellow; a prominent yellowish line begins in occipitotemporal region, continuing the length of neck; a second prominent line begins immediately behind eye and continues above ear to body; chin and throat lined with black and yellow; upper part of legs somewhat reddish.

*Measurements of Cyclemys dhor Gray.*

|                    | mm. |
|--------------------|-----|
| Length of carapace | 192 |
| Width of carapace  | 145 |
| Height of carapace | 70  |
| Length of plastron | 187 |
| Width of plastron  | 117 |
| Tail, from anus    | 40  |

*Variation.*—Besides the specimen described I have at hand two preserved specimens;\* one is medium-sized, the other young.

The medium-sized specimen appears somewhat abnormal or diseased, and it is almost impossible to discern the suture between the shields of the carapace; the keel is obliterated save on the posterior part of the carapace. Head brown, strongly mottled with black, markings on side of head and neck somewhat obscured; each abdominal shield divided completely by a straight suture corresponding to hinge of plastron; elements thus formed not contiguous.

The young specimen has a very strong blunt keel the entire length of the carapace; middle costal shields with a small keel on their posterior parts; all shields rugose; marginals distinctly broader proportionally than in adults; posterior part of carapace very strongly serrate, posterior marginals forming sharp points; a very distinct notch between supracaudals; anterior part of carapace serrate; plastron apparently without hinge; no trace of suture across abdominal shields; a small axillary and a small inguinal shield; no intercalary scutes evident; humerals and abdominals forming direct sutures with marginals; plastral shields rugose. Carapace above olive or yellowish brown, with no dark markings; below very light brown, with dark brown radiating

\* These specimens are unnumbered and belong to the University of the Philippines. They were loaned by Prof. Artemas Day and Dr. R. P. Cowles.

lines around the edges of each shield of plastron and marginals; head with a slight median keel from tip of snout, surface of occipital region finely sculptured; markings on head and neck similar to those of the adult.

There is a carapace of an adult specimen in the Bureau of Science collection which differs from the shell of the adult specimen described in having the entire outer part of the carapace almost entirely dark blackish brown, and the upper part of the costals and the vertebrals with radiating dotted lines; the carapace is rugose, showing distinctly the lines of growth; the abdominal shields have a strong trace of a suture on their anterior parts.

TABLE 2.—*List of Philippine specimens of Cyclemys dhoro Gray.*

| No. | Collection.                         | Locality.    | Collector.       | Age.        |  |
|-----|-------------------------------------|--------------|------------------|-------------|--|
| 1   | W. Schultze .....                   | Palawan..... | W. Schultze..... | Adult.....  |  |
| 2   | University of the Philippines ..... | Leyte.....   | G. Lopez.....    | do .....    |  |
| 3   | Do.....                             | do .....     | do .....         | Young ..... |  |
| 4   | Bureau of Science.....              | Palawan..... | .....            | Adult.....  |  |

| No. | Condition.      | Carapace. |        |         | Plastron. |        |
|-----|-----------------|-----------|--------|---------|-----------|--------|
|     |                 | Length.   | Width. | Height. | Length.   | Width. |
|     |                 | mm.       | mm.    | mm.     | mm.       | mm.    |
| 1   | Living .....    | 192       | 145    | 70      | 187       | 117    |
| 2   | Preserved ..... | 154       | 115    | 68      | 146       | 93     |
| 3   | Do.....         | 75        | 70     | 22      | 64        | 48     |
| 4   | Shell .....     | 180       | 148    | 73      | 177       | 120    |

*Remarks.*—Individual variation in this widely distributed species is strongly marked. It varies greatly at different ages. One can scarcely find two specimens that are wholly alike. The species is terrestrial in habit, apparently only the young frequenting water. In the Philippines the species is known from Palawan, Balabac, and Leyte. It probably occurs on other large islands. It was first reported from the Philippine Islands by Boulenger \* in 1894, on the strength of specimens collected by Everett. The species is known from Java, Borneo, Sumatra, and Nias, Natuna Islands, Banka, Malay Peninsula, Burma, Siam, Annam, and northern India.

\* Ann. & Mag. Nat. Hist. VI 14 (1894) 82.

Genus **HEOSEMYS** Stejneger \*

*Geoemyda* GRAY, Proc. Zool. Soc. London (1834) 100, part; Cat. Tort. (1844) 14; Cat. Shield Rept. (1855) 16; GÜNTHER, Rept. Brit. India (1864) 18; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 25; ANDERSON, Zool. Res. Yunnan (1879) 716; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 135; Fauna Brit. India, Rept. (1890) 23; STRAUCH, Mém. Acad. Sci. St. Pétersburg 38 (1890) 15; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 340; MOCQUARD, Rev. Colon. (1907) 11; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 298.

*Emys* DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 232, part.

*Clemmys* STRAUCH, Chel. Stud. (1862) 28, part.

*Heosemys* STEJNEGER, Proc. Biol. Soc. Washington 15 (1902) 238;

SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 506.

Neural plates mostly hexagonal, short-sided behind; plastron extensively united to carapace by suture; entoplastron intersected by humeropectoral suture; skull lacking a bony temporal arch; anterior part of head covered with undivided smooth skin, posterior occipital and temporal regions with skin divided into scale-like elements; triturating surface of upper jaw rather narrow, without a median ridge; digits fully or partly webbed; five clawed digits on forefoot, four on hind foot; tail very short.

The generic name *Heosemys* was made by Stejneger to include the three species long known under the generic name *Geoemyda*. The latter name, as shown by Stejneger, must stand for the species associated under the name *Nicoria* Gray.

There are three well-known species belonging to the genus *Heosemys*; namely, *H. spinosa* Gray, widely distributed from Burma to the Malay Peninsula and Archipelago; *H. grandis* Gray, found in Burma, the Malay Peninsula, and French Indo-China; and *H. depressa* Anderson, known from Arrakan. A fourth species, from Leyte, Philippine Islands, is here described.

*Key to the species of Heosemys Stejneger.*

a<sup>1</sup>. Anterior margin of carapace serrated.

b<sup>1</sup>. Plastron strongly narrowed in front, with a strong notch between gular and humeral shields; plastron uniform yellow or reddish brown..... *H. leytensis* Taylor (p. 178).

\* Annandale, Rec. Ind. Mus. 9<sup>2</sup> (1913) 64, discusses the various species recognized under the generic names *Geoemyda*, *Nicoria*, *Heosemys*, and *Chaibassia*. He unites the four groups under the name *Geoemyda*. Later (p. 66) he shows in a key that this combined genus falls into three groups which he designates as being equivalent to *Nicoria* Gray, *Heosemys* Stejneger, and *Chaibassia* Theobald. He states "as can be seen from the key, the Indian and Burmese species readily fall into three groups, which perhaps may be ultimately recognized as subgenera."

- b<sup>1</sup>. Plastron moderately narrowed in front, with no notch or only a slight one between gular and humeral shields; plastral shields with radiating lines..... *H. spinosa* Gray.
- a<sup>1</sup>. Anterior margin of carapace not serrated.
- b<sup>1</sup>. Carapace arched or tectiform in a transverse section. *H. grandis* Gray.
- b<sup>2</sup>. Carapace depressed, flat on vertebral region..... *H. depressa* Anderson.

#### HEOSEMYS LEYTENSIS Taylor

PLATE 11, FIGS. 3 AND 4; PLATE 13, FIG. 1

*Heosemys leytensis* TAYLOR, Philip. Journ. Sci. 16 (1920) 131.

*Type*.—An unnumbered specimen in the zoölogical laboratory, University of the Philippines; collected at Cabalian, southern Leyte, by Gregorio Lopez.

*Description of type*.—Adult male. Head large, anterior part covered with smooth undivided skin; skin on posterior part of head and in temporal region divided into scalelike elements; snout bluntly pointed, nostrils anterior, separated by a distance equal to or greater than diameter of a single nostril; eye rather small, slit diagonally, diameter of orbit distinctly less than length of snout; upper jaw with a distinct hook, slightly bicuspid; triturating surface of upper jaw narrow, with an indistinct short ridge or keel near inner edge; choanæ between eyes; ear slightly farther from eye than eye from end of snout; carapace smooth above, rather flattened, with no trace of a keel; vertebral shields all wider than long (fifth anomalous and very irregular and broken, forming an extra costal between it and fourth costal on left side); costals four on each side normally, much broader than long, much broader than vertebrae; eleven marginals on each side; nuchal triangular, broadest posteriorly; anterior marginals touching nuchal, extending far anterior to nuchal and about five times as large as nuchal; supracaudal plates not or but slightly notched, partially fused; anterior part of carapace deeply notched and serrate; laterally smooth, rounded; posteriorly moderately serrate; plastron narrower, very much smaller than opening of shell, not as long as carapace and not extending as far anteriorly, narrowed in front; plastron joined to carapace by strong bony suture; no intercalary shields; a small axillary and an inguinal shield; narrowest part of bridge contained in total length of plastron a little more than two and one-half times; gular shields quadrilateral, outer sides parallel for a distance equal to about half the length of shield; a large angular notch between gular shields and another between gulars and humerals; mutual suture of gulars longer than that of humerals, the latter

somewhat less than suture between pectorals; abdominal shields large, not as broad as pectorals, their mutual suture longer than pectoral or femoral; a deep, more or less semicircular notch between anal shields, suture between anals abnormal; foreleg with transversely somewhat enlarged irregular scales; four prominent scales on upper edge of arm, the two median much the largest; a large transverse scale on heel of forefoot and a few small scales on back part of sole; five digits, each with a strong curved claw, digits fully webbed, foot cushionlike; one or two small scales at base of claws; four digits on hind foot with strong curved claws; enlarged scutes on upper edge of hind leg and a few small ones on heel, none on sole; two or three enlarged scutes above digits near ends; tail very short, without enlarged scales above or below; skin on legs, body, and neck with minute tubercles, giving it a feel like sandpaper.

*Color in alcohol.*—Above reddish rusty brown, darker on anterior marginals; uniform reddish brown on plastron, darkest on bridge and on anterior part; head uniform dark brown, slightly lighter posteriorly; a narrow transverse yellow line crossing posterior part of head and continuing to posterior border of ear; upper part of neck dark; lighter, more or less reddish brown on sides and underside of neck; legs dark above, lighter below.

*Measurements of Heosemys leytensis Taylor.*

|   | mm. |
|---|-----|
| Total length, tip of snout to end of tail | 330 |
| Length of carapace                        | 210 |
| Width of carapace                         | 145 |
| Height of carapace                        | 70  |
| Length of plastron                        | 180 |
| Width of plastron                         | 115 |
| Length of head                            | 55  |
| Width of head                             | 42  |
| Depth of head                             | 31  |
| Eye to ear                                | 15  |
| Eye to tip of snout                       | 13  |

*Variation.*—A second specimen from the same locality is medium-sized and differs in a number of characters from the adult. A dim keel in posterior part of carapace; distinct diagonal grooves in upper part of costal shields, parallel to their sutures with vertebrals; all shields of carapace showing lines of growth; carapace dimly serrate anteriorly, nuchal notch rather shallow; marginals bordering nuchal not extending anterior to nuchal more than half its length (in the adult they extend beyond the nuchal a distance about equal to its length); a distinct notch

between supracaudals; plastron similar to that of adult; carapace brown; plastron yellow; top of head brown, dimly mottled in temporal region; two very distinct transverse yellow lines on sides of head which barely fail to meet dorsally, these lines continuing below ear; a yellow spot on each side of lower jaw. Length of carapace, 126 millimeters; of plastron, 118.

*Remarks.*—Only these two specimens are known. Both are from the same locality in Leyte. The species can be readily distinguished by the absence of the temporal arch and by the yellow ring on the posterior part of the head.

### CHELONIIDÆ

*Cheloniidæ* COPE, Proc. Am. Phil. Soc. 20 (1882) 143.

Large turtles with paddle-shaped legs; nine plastral bones covered with epidermal horny shields; caudal vertebræ procœlous; neck not completely retractile; temple roofed over, parietal bone in contact with squamosal; one or two claws on each leg.

#### Genus ERETMOCHELYS Fitzinger

*Caretta* RITGEN, Nova Acta Acad. Leop.-Carol. 14 (1828) 270 (not of Rafinesque).

*Eretmochelys* FITZINGER, Syst. Rept. (1843) 30.

*Onychochelys* GRAY, Proc. Zool. Soc. London (1873) 397.

Marine turtles, having paddle-shaped legs, each with two claws; carapace with four pairs of costals and two pairs of prefrontal scales; scales of carapace imbricating, with three keels; two keels on plastron.

The turtles of this genus furnish the precious tortoise-shell of commerce, which is an important article of export from the Philippine Islands.

#### ERETMOCHELYS IMBRICATA (Pennant)

PLATE 15, FIGS. 1 AND 2; PLATE 16, FIGS. 5 AND 6

*Testudo imbricata* PENNANT, Ind. Zool. (1769) 87.

*Chelonia Eretmochelys imbricata* FITZINGER, Syst. Rept. (1843) 30.

*Eretmochelys imbricata* AGASSIZ, Contr. 1 (1857) 381; STEJNEGER, Report U. S. Nat. Mus. for 1902 (1904) 719.

*Chelonia imbricata* SCHWEIGGER, Prodr. Mon. Chel. (1814) 21.

*Caretta imbricata* MERREM, Syst. Amph. (1820) 19.

*Onychochelys kraussii* GRAY, Proc. Zool. Soc. London (1873) 398.

*Chelonia virgata* WAGLER, Icon. et Desc. Amph. (1833) pl. 29.

*Chelonia multiscutata* KUHLE, Beitr. (1820) 78.

*Chelone imbricata* BOETTGER, Ber. Senck. Nat. Ges. (1886) 93 (Jolo).

*Eretmochelys squamata* AGASSIZ, Contr. Nat. Hist. U. S. Am. 1 (1857) 382; GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 25 (1883) 300.

*Caretta imbricata* KELAART, Rept. Ceylon 1 (1852) 180.

*Caretta squamosa* GIRARD, U. S. Expl. Exp., Rept. (1858) 442.

*Caretta rostrata* GIRARD, U. S. Expl. Exp., Rept. (1858) 446.

*Eretmochelys squamosa* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 511.

*Description of species.*—(From No. 1474, Bureau of Science collection; collected at Aparri, Luzon, November, 1908.) Snout beaked, somewhat projecting over lower jaw; nostrils small, vertical; postnasal shields moderate, five-sided, entering orbit; prefrontals much larger than postnasals, pentagonal, forming a straight median suture; azygous prefrontal hexagonal; frontal large, eight-sided, with a small suture entering anteriorly, forming its longest sutures with supraocular, wider than long; two equal-sized parietals, distinctly shorter than frontal; a large temporal scale bordering frontal; supraocular and parietal on each side; three postocular shields entering orbit, two lower largest; these bordered by temporals; two upper temporal elements larger than lower; a large elongate shield on either side of lower jaw; region above eye with small irregular scales; lower lid with tubercular scutes; carapace covered with large imbricating shields; five vertebral shields; four pairs of costal shields; eleven marginal shields on each side; a single nuchal shield; a pair of supracaudal shields; vertebrals with a strong vertebral keel; two lateral keels on upper part of costal; posterior edge of each shield with a thornlike point; posterior edge of carapace strongly serrate; plastral elements normal; a single azygous scute between gulars; pectoral and abdominal shields largest; plastron separated from carapace by a series of four enlarged intercalary shields; a few small axillary shields, largest between humeral and first intercalary; a single small inguinal scale; plastron with two strong keels with a prominent depression between them; legs paddlelike, anterior much larger than posterior; inner side of leg with eight shields, broader than long; tip of leg with two enlarged shields, separated by a smaller shield; outer side of leg with sixteen scutes, two of which bear distinct claws; hind legs with eleven scutes on anterior edge, two of which bear small claws; tail very short, not extending to tip of carapace.

*Color in alcohol.*—Above deep brown, streaked or mottled with amber of varying shades; legs similar; head shields blackish brown, lighter on sutures; lateral shields amber, with brown spots; plastron yellow to amber, with a brown spot on posterior part of each shield.

*Measurements of Eretmochelys imbricata* (Pennant).

|                                     | mm. |
|-------------------------------------|-----|
| Total length                        | 244 |
| Length of carapace                  | 173 |
| Width of carapace                   | 130 |
| Length of plastron                  | 134 |
| Width of plastron, across pectorals | 81  |
| Length of foreleg                   | 98  |
| Length of hind leg                  | 53  |
| Length of head                      | 47  |
| Width of head                       | 30  |

*Variation.*—A very young specimen, measuring 105 millimeters to end of carapace, is dark blackish brown to black; tips of marginals and outer edges of legs yellowish; plastron black; body skin blackish; scutes of head, carapace, and plastron identical with those of the described specimen. A carapace in the Bureau of Science collection measures 395 millimeters. There are three specimens living in the Bureau of Science aquarium.

*Remarks.*—The turtle here described appears to be of the species figured by Stejneger\* under the name *Eretmochelys imbricata*. Between Stejneger's drawing and the described specimen in the Bureau of Science collection there is no appreciable difference.

Genus *CARETTA* Rafinesque

*Caretta* RAFINESQUE, Specchio Sci. Palermo 2 (1814) 66.

\* *Thalassochelys* FITZINGER, Ann. Wien Mus. 1 (1835) 121.

*Caouana* COCTEAU in Sagra's Hist. Fis. Pol. Nat. Cuba, Rept. 4 (1838) 31.

Marine turtles with paddle-shaped legs; two pairs of prefrontals present; five or more pairs of costal shields; shields on back not imbricate.

*CARETTA OLIVACEA* (Eschscholtz)

## PLATE 16, FIGS. 1 AND 2

*Chelonia olivacea* ESCHSCHOLTZ, Zool. Atlas 1 (1829) pl. 3 (Manila Bay).

*Caouana olivacea* GRAY, Cat. Tort. (1844) 53 (Philippines); GÜNTHER, Rept. Brit. India (1864) 52 (seas of Philippines).

*Caretta olivacea* GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 52 (1908) 9.

*Thalassochelys olivacea* BOETTGER, Ber. Senck. Nat. Ges. (1886) 93.

*Thalassochelys caretta* CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 404 (Manila Bay).

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\* Report U. S. Nat. Mus. for 1902 (1904) 718, figs. 193-197.

*Description of species.*—(From a specimen living in the Bureau of Science aquarium.) Anterior pair of prefrontals distinctly smaller than second pair; a small, rather elongate azygous prefrontal between the two supraoculars; frontal large, much wider than long, followed by four parietals; a large temporal (or parietal) element follows supraocular shield and borders frontal and outer parietal; three postocular shields, upper smallest, middle largest, lower elongate; postoculars bordered by four temporals, second from top largest; a distinct median keel on carapace, more prominent posteriorly; six pairs of costals; nuchal divided; six vertebral shields, fifth very small; thirteen marginals on each side; two supracaudals; plastron normal; four large shields between carapace and plastron; a small inguinal shield and a group of eight axillary shields, four of which touch pectorals and humerals; a small round shield behind anal shields.

*Color in life.*—Above olive drab to gray, rather lighter about suture; sides and underside of neck whitish; plastron whitish.

*Measurements of Caretta olivacea (Eschscholtz).*

|                                     | mm. |
|-------------------------------------|-----|
| Length of carapace                  | 340 |
| Width of carapace                   | 325 |
| Height of carapace                  | 110 |
| Length of foreleg                   | 260 |
| Width of foreleg                    | 70  |
| Length of hind leg                  | 180 |
| Width of hind leg                   | 70  |
| Length of plastron                  | 275 |
| Width of plastron                   | 280 |
| Length of tail, from anus           | 15  |
| Length of head, to end of parietals | 90  |
| Depth of head                       | 55  |

*Variation.*—This species is known to be subject to a great amount of variation. Thus the usual number of costals is five; but in the Manila specimen figured by Eschscholtz there appear to be seven on one side and six on the other, with seven vertebrals; there are thirteen marginals on each side. I am uncertain whether the nuchal is divided. There are several characters about Eschscholtz's figure that differ markedly from my specimen, but these may be due to poor drawing. The squamation of the neck, the position of the nostrils, the shape of the occipital region, and the squamation of the legs—all appear to differ greatly.

*Remarks.*—This species and an agamid lizard appear to be the first recorded Philippine reptiles. The species is not rare and is taken frequently in Manila Bay.

### Genus *CHELONIA* Latreille

*Chelonia* BRONGNIART, Bull. Soc. Philom. Paris 2 (1800) 89 (*nomen nudum*); LATREILLE, Hist. Nat. Rept. 1 (1802) 22; WAGLER, Syst. Amph. (1830), 132, part; GRAY, Syn. Rept. (1831) 51; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 530; Cat. Zool. (1844) 54; Cat. Shield Rept. 1 (1855) 74; GIRARD, U. S. Expl. Exped., Herp. (1858) 452; GÜNTHER, Rept. Brit. India (1864) 52; GRAY, Suppl. Cat. Shield Rept. (1870) 119; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 509.

*Chelone* BRONGNIART, Mem. Sav. Etrang. 1 (1806) 610; STRAUCH, Chel. Stud. (1862) 59; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 180.

*Chelonias* RAFINESQUE, Specchio Sci. Palermo 2 (1814) 66.

*Caretta* MERREM, Tent. Syst. Amph. (1820) 19, part; GRAY, Cat. Tort. (1844) 53; Cat. Shield Rept. (1855) 73.

*Mydas* COCTEAU, in Sagra's Hist. Fis. Pol. Nat. Cuba 4 (1838) 22; GRAY, Suppl. Cat. Shield Rept. (1870) 119.

### *CHELONIA JAPONICA* (Thunberg)

PLATE 17, FIGS. 1 TO 4

*Testudo japonica* THUNBERG, Svensk. Vetensk. Acad. Nya Handl. 8 (1787) 178, pl. 7, fig. 1.

*Chelonia japonica* SCHWEIGGER, Prodr. Mon. Chel. (1814) 21.

*Chelonia virgata* SCHWEIGGER, Prodr. Mon. Chel. (1814) 21.

*Chelonia viridis* TEMMINCK and SCHLEGEL, Fauna Japon., Rept. (1835) pl. 4, figs. 4, 5, 6; pl. 6, figs. 1, 2.

*Chelonia japonica* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 509; GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 52 (1908) 8.

*Description of species.*—(From a living specimen in the Bureau of Science aquarium.) Head large; beak somewhat hooked; a single pair of large prefrontals, longer than wide, that on right side partially broken; a small azygous hexagonal prefrontal between supraoculars, which are larger; four postoculars on left side, five on right side, lowest largest; frontal large, somewhat notched in front, bordered behind by five parietals; frontal and parietals bordered by two temporals; postoculars bordered by four shields, two upper largest; this series of temporals followed by five or six unequal-sized shields and two or three very small ones, making a total of about twenty shields in temporal region behind eye; supraocular region with a series of small shields; lower jaw with narrow mental followed by a large elongate shield which is followed by several smaller ones; carapace smooth; five vertebral shields; four pairs of costals; eleven

pairs of marginals, first pair in contact with first vertebral on either side of nuchal, which is single; a pair of supracaudals; legs long, with a single claw, anterior edge of front leg with fifteen shields, about ten on posterior edge; a round isolated shield near upper part of underside of leg not bordering outer edge; anterior part of hind leg with eight shields; a single claw present; plastron smooth, attached to carapace by four large intercalary plates; six distinct axillary scales; pectoral shields widest on plastron.

*Color in life.*—Above rusty reddish brown, each shield streaked with amber, head shields distinctly reddish, each edged with black; shields on side of head dark, with yellow along sutures; shields on legs with black centers; plastron yellow.

*Measurements of Chelonia japonica (Thunberg).*

|                                    | mm. |
|------------------------------------|-----|
| Total length                       | 735 |
| Length of carapace                 | 555 |
| Width of carapace                  | 470 |
| Height of carapace                 | 180 |
| Length of plastron                 | 448 |
| Width of plastron, across pectoral | 290 |
| Length of head                     | 125 |
| Width of head                      | 90  |
| Depth of head                      | 100 |
| Tail, behind anus                  | 28  |

*Variation.*—The head shields of this species are subject to more or less variation. In a second specimen living in the aquarium there is a second pair of prefrontals bordering the nasal area but not touching the beak. These shields are small and irregular.

*Remarks.*—The species is common in the Philippine Islands. Specimens have been kept alive in the aquarium. They are very frequently taken in Manila Bay. They are fed on fish.

### Suborder CHILOTÆ

*Chilotæ* WIEGMANN, Handb. Zool. (1832) 167.

This suborder consists of one family.

### TRIONYCHIDÆ

*Trionychidæ* BELL, Zool. Journ. 3 (1828) 515.

Carapace and plastron without outer scales or shields and not entirely ossified, covered with leathery skin; head completely retractile; no external ear; bony part of jaws concealed under thick lips; three digits with claws; nostrils at end of a flexible proboscis.

Only a single genus of this family is positively known from the Philippine Islands. Species of three other genera have been reported but probably erroneously. They are the following:

*Dogania subplana* (Geoffroy Saint Hilaire). Reported by Casto de Elera\* as *T [rionyx] subplanus*, from Mindanao and Palawan, with specimens in the Santo Tomás Museum and in turn listed from the Philippines by Siebenrock† and de Rooij,‡ on the strength of Casto de Elera's record. No specimen is now in the Santo Tomás Museum.

*Chitra indica* Gray. This species was first reported from the Philippine Islands by Gray, who later made the specimen the type of *Pelochelys cumingi*, which is now regarded as synonymous with *P. cantorii*. Casto de Elera also reports the species from the Philippines, locality Palawan, with a specimen in the Santo Tomás Museum. This specimen is no longer extant.

*Trionyx sinensis* Wiegmann. Reported by Casto de Elera from the Batan Islands, and later by Siebenrock on the strength of the former record. The specimen reported as present in the Santo Tomás Museum is no longer extant.

*Dogania subplana* occurs in Java and Borneo; Stejneger regards its presence in Formosa as doubtful. *Chitra indica* is known only from India. *Trionyx sinensis* occurs in Formosa, and a specimen has been reported from Timor.

#### Genus PELOCHELYS Gray

*Chitra* GRAY, Cat. Shield Rept. 1 (1855) 70, part; GÜNTHER, Rept. Brit. India (1864) 50.

*Pelochelys* GRAY, Proc. Zool. Soc. London (1864) 89; (1873) 40; Suppl. Cat. Shield Rept. 1 (1870) 90; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 262; Fauna Brit. India, Rept. (1890) 15; STRAUCH, Mém. Acad. Sci. St. Pétersburg VII 38 (1890) 34; BAUR, Ann. & Mag. Nat. Hist. VI 7 (1891) 445; Proc. Am. Phil. Soc. 31 (1893) 221; OGILBY, Proc. Roy. Soc. Queensland 19 (1905) 29; SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 606.

"Outer extremities of the nuchal plate overlying the second dorsal rib; neural plates well developed. Limbs completely exposed. Hyoplastron distinct from hypoplastron; not more than five plastral callosities. Bony choanæ between the orbits; jaws weak; postorbital arch as broad as the diameter of the orbit; posterior border of pterygoids free, without ascending process." (*Boulenger.*)

Only one species of the genus is known.

\* Cat. Fauna Filipinas 1 (1895) 407.

† Zool. Jahrb. Suppl. 10 (1909) 606.

‡ Rept. Indo-Aust. Arch. 1 (1915) 326.

## PELOCHELYS CANTORII Gray

PLATE 16, FIGS. 3 AND 4

- Chitra indica* GRAY, Cat. Tort. (1844) 49, part; Cat. Shield Rept. (1855) 49; GÜNTHER, Rept. Brit. India (1864) 50, pl. 6, fig. C.
- Gymnopus indicus* CANTOR, Cat. Mal. Rept. (1847) 10.
- Pelochelys cantorii* GRAY, Proc. Zool. Soc. London (1864) 90, figs. 9 and 10; (1869) 215; THEOBALD, Journ. Linn. Soc. (1868) 10; Cat. Rept. Brit. India (1876) 28; BAUR, Proc. Am. Phil. Soc. 31 (1893) 221; OGILBY, Proc. Roy. Soc. Queensland 19 (1905) 29; SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 607.
- Pelochelys cumingii* GRAY, Proc. Zool. Soc. London (1864) 90; Cat. Shield Rept. Suppl. (1870) 91 (type locality Philippines).
- Pelochelys bibronii* GRAY, Proc. Zool. Soc. London (1864) 90; Cat. Shield Rept. Suppl. (1870) 91.
- Pelochelys cantoris* BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 263; Fauna Brit. India, Rept. (1890) 15; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 406; FLOWER, Proc. Zool. Soc. London (1899) 621; WERNER, Zool. Jahrb. 13 (1900) 483; SIEBENROCK, Sitz. Ber. Wiss. Wien 111 (1902) 832, fig. 12; 112 (1903) 350; Zool. Jahrb. Suppl. 10 (1909) 607.
- Pelochelys cantori* DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 331.

*Description of species.*—"Costal plates eight pairs, the last well developed and forming a median suture; a single neural between the first pair of costals; plates coarsely pitted and vermiculate. Dorsal skin of young tuberculate. Epiplastra small and widely separated; entoplastron forming a right or an acute angle; plastral callosities largely developed. Head moderate; snout very short and broad; proboscis very short; interorbital space broader than the greatest diameter of the orbit; mandible narrowest at the symphysis. Olive above, uniform or spotted with darker; lips and throat of young olive, speckled with whitish; plastron whitish." (*Boulenger.*)

A living specimen in the Bureau of Science aquarium has the following measurements:

*Measurements of Pelochelys cantorii Gray.*

|                             | mm. |
|-----------------------------|-----|
| Length of carapace          | 350 |
| Width of carapace           | 315 |
| Height of carapace          | 76  |
| Length of plastron          | 295 |
| Width of plastron           | 290 |
| Total length, head extended | 630 |

The following characters are evident in the living aquarium specimen: Carapace moderately flat, composed of a bony inner part surrounded by a wide, soft, cartilaginous rim, the part above the neck bending down strongly, more or less covered with fine sculpturing and rounded tubercles; bony part sculptured

and more or less pitted; soft part of carapace posteriorly with lines crisscrossed at nearly right angles; on the sides these lines longitudinal and not crossing; a depressed area running lengthwise of carapace medially; three inner toes of fore and hind legs with long, strong claws, the claw of inner toe largest; the two outer toes not extending beyond the edge of the strong web which extends along the leg; a small callosity at base of inner toes on both feet; a strong scalelike callosity across outer part of foreleg, three callosities in the web on outer side of foreleg; one large, elongate callosity in the web on posterior side of hind leg, a heavy widened scalelike callosity on heel; head very large, much widened in temporal region; proboscis short; lips very thick; eye small, with a dark line in front and behind pupil; tail very short behind anus.

*Color in life.*—Head above olive, with minute black dots; carapace olive, with a few darker and lighter striations along the median dorsal part; outer edge olive, with small spots of darker and lighter color; plastron flesh color, with a few white dots on anterior part; chin and throat with minute dots of black and white.

*Remarks.*—The specimen \* in the aquarium was captured in 1918 at San Miguel, Bulacan Province, Luzon, by Mr. Genesio Pating, and was presented to the aquarium by Mr. George Symmonds, of Manila. The turtle does very well in captivity and takes food regularly. The food given is small dead fish. In the same tank are kept specimens of *Cyprinus carpio* (Chinese carp), and *Megalops cyprinoides* (*buan-buan*), and these living fish are not molested. When living specimens of *Ophiocephalus striatus* (the mud fish, or *dalag*), were placed in the same aquarium they were frequently killed. In Luzon the species is known as *antipa*; it appears to be rare. Individuals grow to be more than a meter long.

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\* The turtle here mentioned died since this paper was written; the specimen was preserved, but was destroyed by the Carnival fire in 1920.

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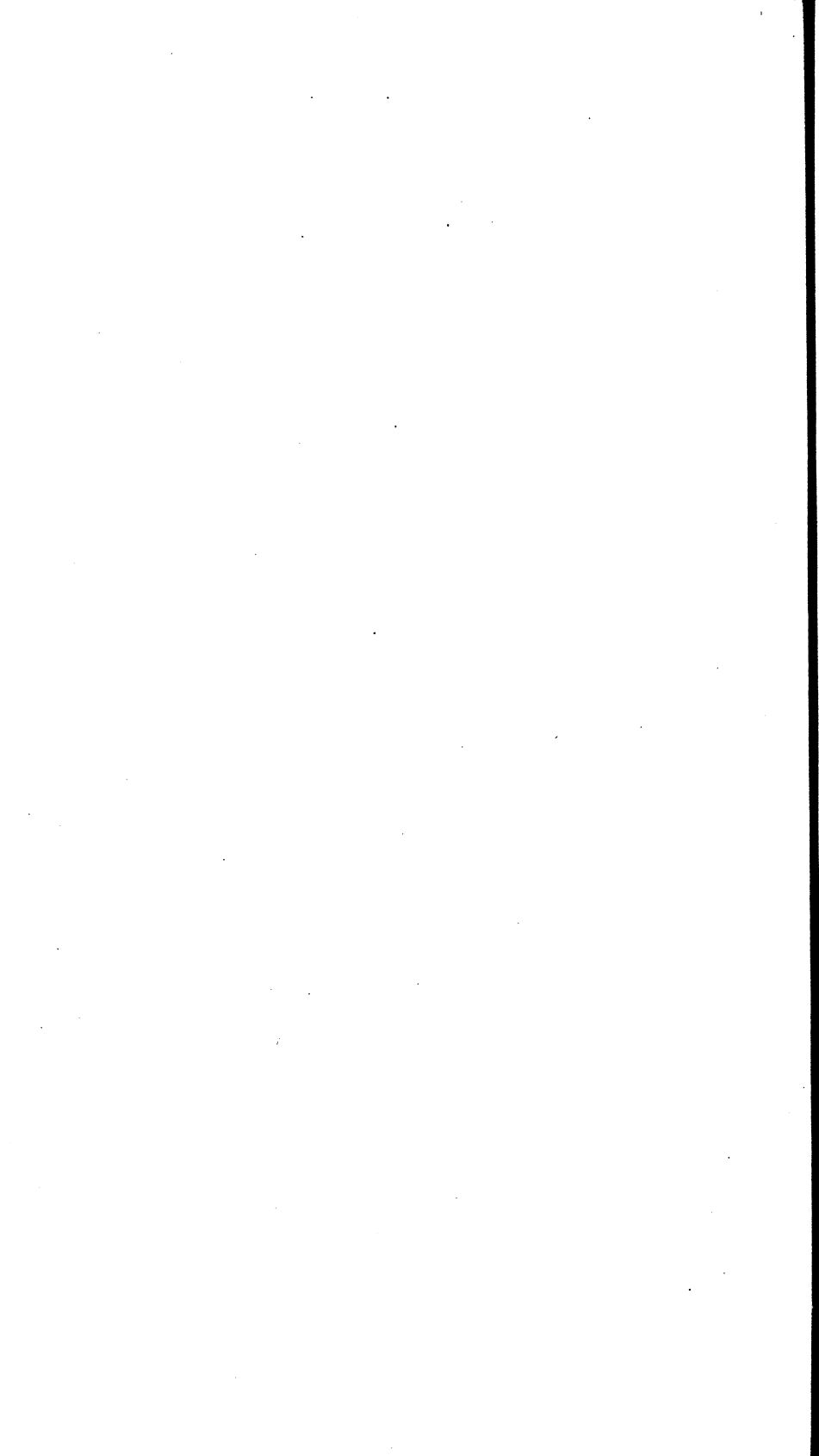
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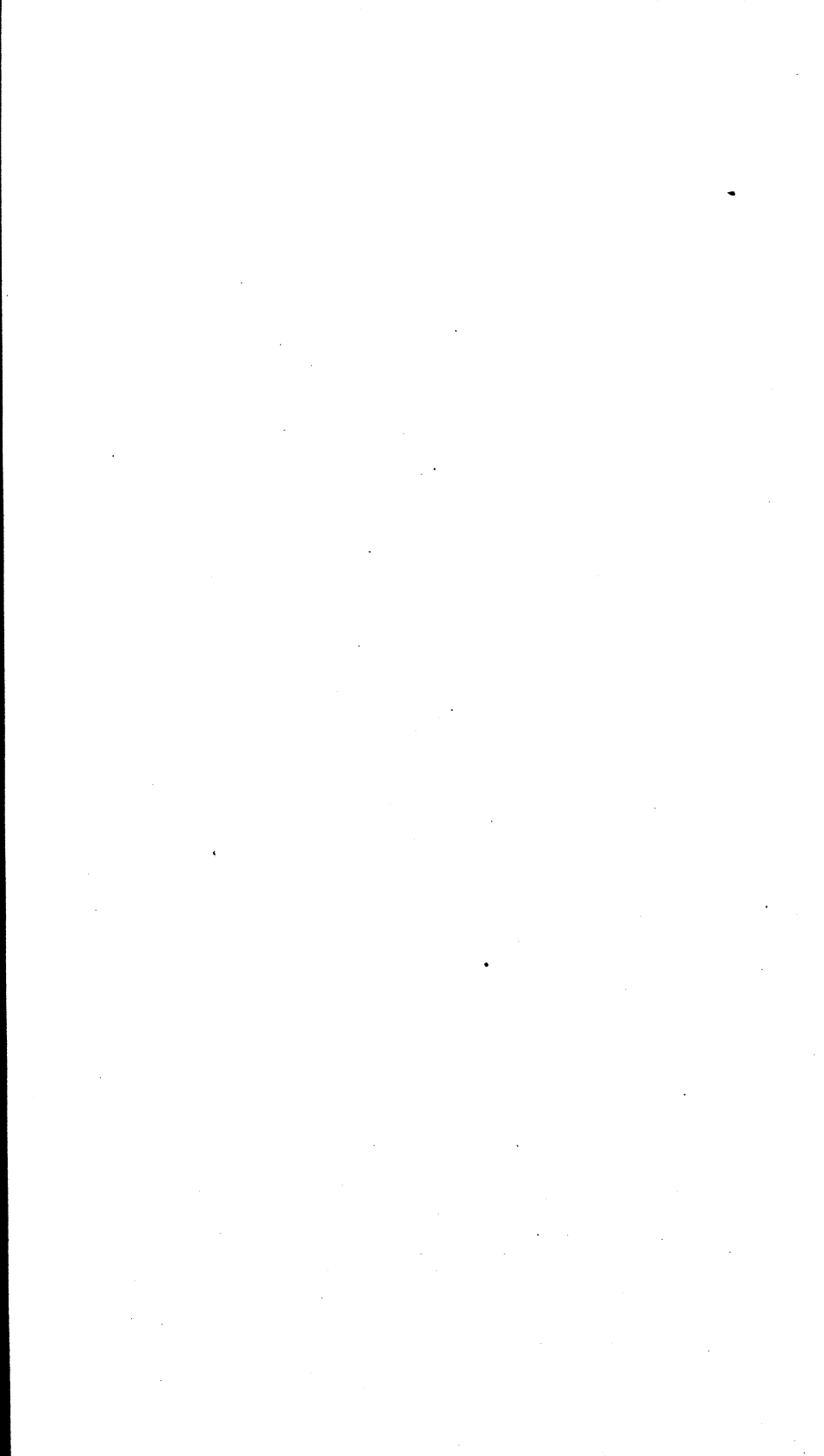
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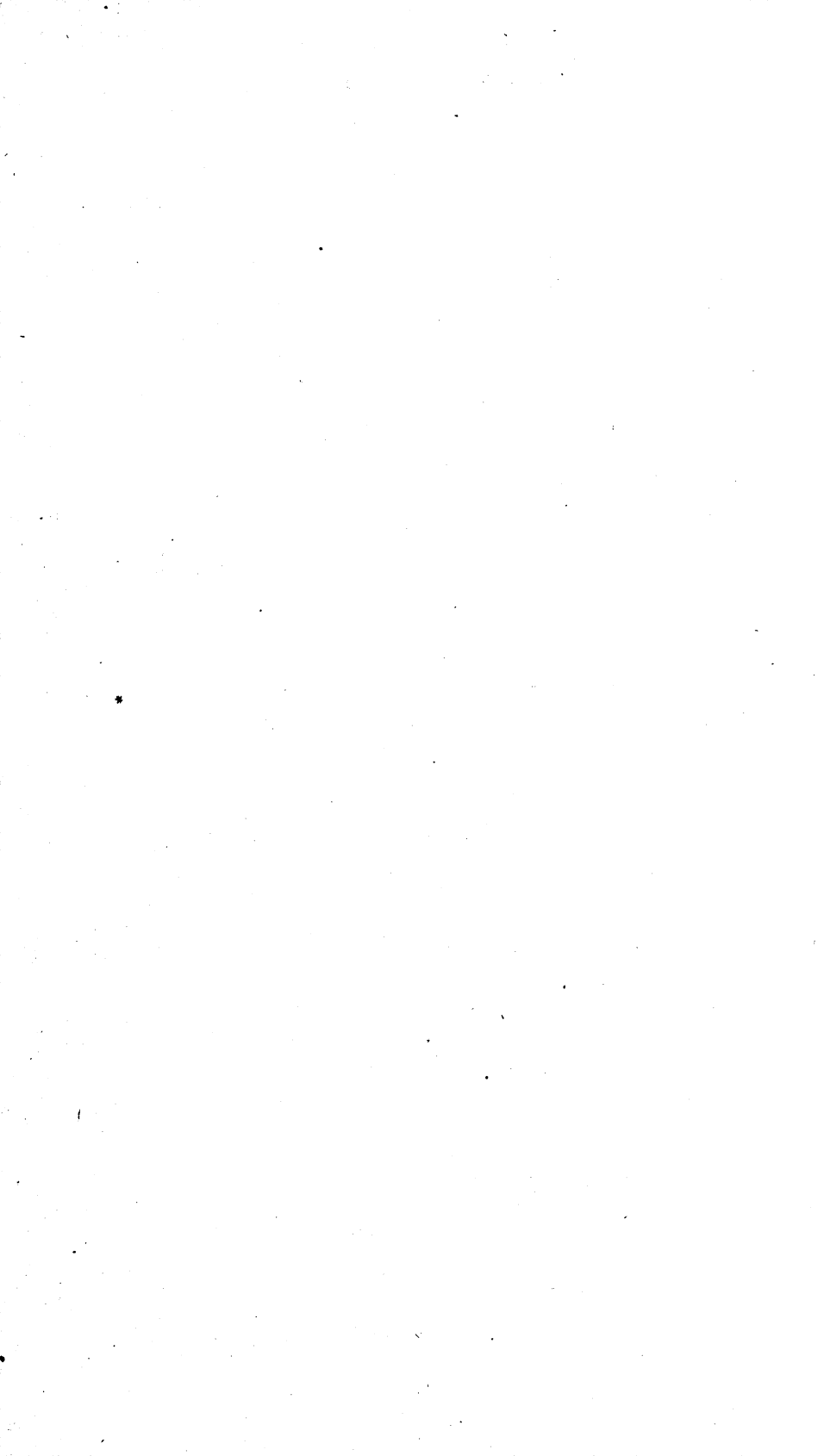
# THE SNAKES OF THE PHILIPPINE ISLANDS

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# THE SNAKES OF THE PHILIPPINE ISLANDS

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## PREFACE

This monograph is the result of a careful study of about three thousand specimens of Philippine snakes, preserved for the most part in the collection of the Bureau of Science and in my own private collection. Through the courtesy of the directors of the Museo de Santo Tomás and El Ateneo de Manila, I was also able to make a study of numerous specimens contained in their important collections. A few specimens at Silliman Institute, Dumaguete, Oriental Negros, were examined, as well as a few in some of the private collections in Manila.

In most cases the descriptions given in this work are of normal Philippine specimens; where no specimen has been available, I have taken a description given by another author. In the definition of genera, I have drawn very largely on Boulenger.\*

I have also drawn on various other authors and on my own previous papers for illustrations, and in each case credit has been duly given. Most of the original drawings here published were made by Macario Ligaya.

It has been impossible to examine all the literature treating of Philippine herpetology; but many works are included in the synonymies which I have been unable to examine.

It is a matter for regret that I have not had access to European herpetological collections from the Philippines. For the most part, collections in European institutions were studied and reported on before the appearance of Boulenger's work, and in consequence the identifications are frequently incorrect or untrustworthy. However, the necessity for an examination of the European collections has been largely obviated by Boulenger's admirable work.† I have examined various collections in America.

As companion volumes to *The Snakes of the Philippine Islands* I have prepared *The Lizards of the Philippine Islands* and *Amphibians and Turtles of the Philippine Islands*. It is expected that the three volumes will be published at about the same time.

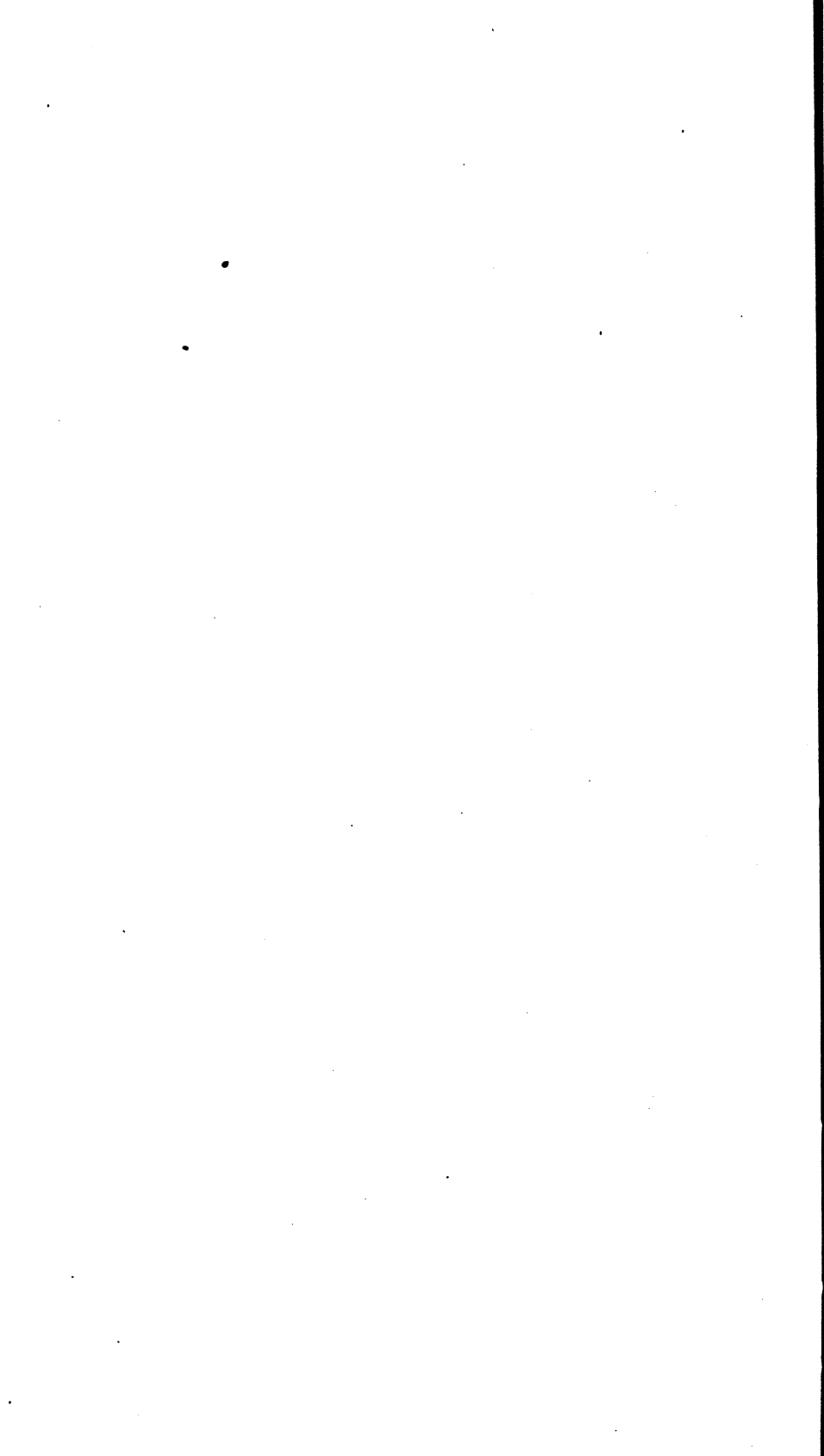
EDWARD H. TAYLOR.

MANILA, P. I., *July 4, 1919.*

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\* Cat. Snakes Brit. Mus. 1-3 (1894-1896).

† Op. cit. N. R. J.



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\* This family is nonpoisonous.

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### PLATE 2

*Xenopeltis unicolor* Reinwardt; from a photograph of a Palawan specimen.

### PLATE 3

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### PLATE 8

*Ophites subcinctus* (Boie); from a photograph of a preserved specimen from Palawan.

### PLATE 9

*Haplonodon philippinensis* Griffin; from the type;  $\times 1$ .

### PLATE 10

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## PLATE 11

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- Holarchus burksi* Taylor; drawn from the type.

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- Liopeltis philippinus* (Boettger); from a photograph of a Palawan specimen.

## PLATE 21

- Dendrelaphis caudolineatus* (Gray); from a photograph of a preserved specimen from Palawan.

## PLATE 22

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## PLATE 23

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## PLATE 28

*Dryophis preocularis* sp. nov.; from a photograph of the type.

## PLATE 29

*Laticauda colubrina* (Schneider); after Cuvier.

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*Laticauda semifasciata* (Reinwardt); after Schlegel.

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## PLATE 33

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## PLATE 36

*Trimeresurus schultzei* Griffin; from a photograph of a Palawan specimen.

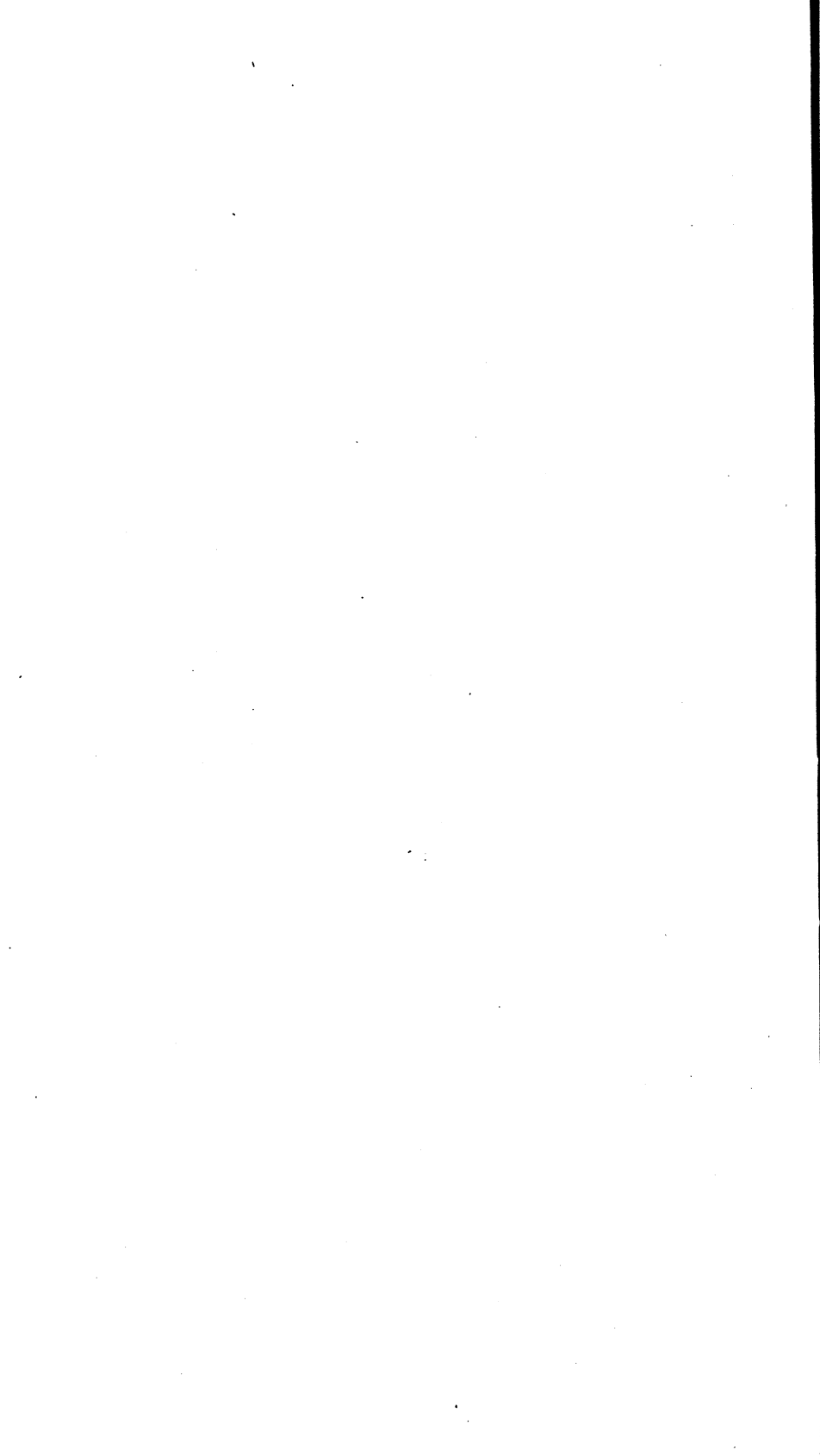
## PLATE 37

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## TEXT FIGURES

- FIG. 1. Head shields of typical Typhlopidae, *Typhlops suluensis* Taylor; *e*, eye; *f*, frontal; *ip*, interparietal; *ins*, internasal suture; *lab*, labials; *n*, nasal; *nos*, nostril; *o*, ocular; *par*, parietal; *pf*, prefrontal; *po*, postocular; *preo*, preocular; *r*, rostral.
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22. *Laticauda semifasciata* (Reinwardt); after Wall; *a*, head, dorsal view; *b*, head, lateral view; *c*, chin.
23. *Disteira cincinnatii* Van Denburgh and Thompson; after Van Denburgh and Thompson; *a*, head, dorsal view; *b*, head, lateral view; *c*, chin; *d*, anterior ventrals; *e*, anal region; *f*, ventrals.
24. *Disteira ornata* (Gray); drawing of a specimen from Manila Bay; *a*, head, dorsal view; *b*, head, lateral view; *c*, head, ventral view;  $\times 2$ .
25. *Disteira cyanocincta* (Daudin); after Wall; *a*, head, dorsal view; *b*, head, lateral view; *c*, head, ventral view.
26. *Disteira cyanocincta* (Daudin); after Jan's *D. westermanni*; *a*, head, lateral view; *b*, head, lateral view (variation).
27. *Lapemis hardwickii* Gray; after Günther; *a*, head, dorsal view; *b*, head, lateral view; *c*, chin.
28. *Pelamydrus platurus* (Linnæus); after Stejneger; *a*, head, dorsal view; *b*, head, lateral view; *c*, head, ventral view.
29. *Naja hannah* (Cantor); after Boulenger; *a*, head, dorsal view; *b*, head, lateral view.
30. *Naja naja miolēpis* (Boulenger); *a*, head, dorsal view; *b*, head, lateral view; *c*, chin;  $\times 1$ .
31. *Trimeresurus mcgregori* Taylor; from the type; *a*, head, dorsal view; *b*, head, lateral view; *c*, head, ventral view;  $\times 1$ .
32. *Trimeresurus flavomaculatus* (Gray); after Boulenger's *Lachesis flavomaculatus*; *a*, head, dorsal view; *b*, head, lateral view.



# THE SNAKES OF THE PHILIPPINE ISLANDS

By EDWARD H. TAYLOR

## INTRODUCTION

Since American occupation in 1898, a few notable herpetological collections have been made in the Philippines, which have resulted in the discovery of several species new to science and of others heretofore unknown for the Islands. The collections in the Bureau of Science were enriched by the work of H. M. Weber and W. Schultze in Palawan, of C. Canonizado in Polillo, and of Lawrence E. Griffin in Mindoro, Palawan, Bantayan, and Luzon. Since 1912 I have collected extensively in central eastern Mindanao, Negros, Mindoro, Palawan, Busuanga, Lubang, Sulu Archipelago, and Luzon.

Dr. Lawrence E. Griffin during his stay in the Islands made a preliminary study of the collection in the Bureau of Science and later published four papers. One of these describes two new species of snakes from Negros, one gives a list of Palawan snakes, another gives a list of snakes from Polillo, and the fourth is a checklist and key to all known Philippine snakes.

The results of my collecting in Negros and in Sulu are incorporated in two short papers treating of the reptilian faunas of those localities. Another paper treats of the genus *Holarchus* and describes two new species. A fourth paper\* includes descriptions of several new snakes from various Philippine localities. In the present monograph the following supposedly new species and subspecies are described:

*Typhlops dendrophis.*

*Typhlops mindanensis.*

*Calamaria suluensis.*

*Calamaria tropica.*

*Boiga dendrophila divergens.*

*Dryophis griseus.*

*Dryophis preocularis.*

*Hemibungarus mcelungi.*

*Naja naja philippinensis.*

In spite of a rather thorough exploration of some parts of the Islands herpetologically, large areas are comparatively unknown. Thus, I have not a single authentic record for Bohol or for Marinduque, and very few for Cebu, Masbate, Leyte, Panay, and

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\* Philip. Journ. Sci. 14 (1919) 105-125.

Catanduanes. The fauna of the interior of Mindoro is practically unknown, as are also the faunas of high mountains everywhere in the Islands. Undoubtedly many new species and subspecies await discovery.

Species that occur in various islands may show variations which in many cases are small but constant. Thus it is frequently possible to state the locality from which a specimen comes by mere examination. Such variations may consist of a higher or a lower average of ventrals or subcaudals; a difference in marking or color; or in the proportions or the relations of the various head scales. Undoubtedly larger collections will permit the naming of numerous subspecies. Not infrequently we find that the variations in various species belonging to different genera, or even families and orders, may have the same trend; that is, there may be an increase or a reduction in the number of ventrals, or of the scale rows, or of loreals, or there may be curious anomalies in scale formation.

This is of course to be expected, since the same environmental conditions of food, temperature, rainfall, elevation, nature of soil, etc., might easily bring about related changes in the fauna of a particular locality. Certainly a study of these interrelated variations on various islands would do much to solve, beyond question, the part environment plays in the bringing about of a new species, which in my own opinion is certainly no small one.

#### HISTORICAL

Some of the earliest writers on the Philippines have left records of snakes—records which are for the most part native stories or superstitions, but at all events interesting.

Antonio de Morga \* writes in 1609:

The forests and settlements have many serpents, of various colors, which are generally larger than those of Castilla. Some have been seen in the forests of unusual size, and wonderful to behold. The most harmful are certain slender snakes, of less than one vara in length, which dart down upon passersby from the trees (where they generally hang), and sting them; their venom is so powerful that within twenty-four hours the person dies raving.

The large snakes are doubtless *Python reticulatus*; the slender snakes might refer to any or all of several species.

Diego de Bobadilla † writes in about 1640:

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\* *Sucesos de las Islas Filipinas*, by Antonio de Morga, Mexico, 1609. Translated by Blair and Robertson, *The Philippine Islands 1493-1898*. Cleveland, The Arthur H. Clark Co. 16 (1904) 93.

† From *Relation of the Filipinas Islands*, by Diego de Bobadilla, S. J., 1640; in Blair and Robertson, *op. cit.* 29 (1905) 301.

There are many snakes in those islands, which are very dangerous; some of them, when they have young, attack people.<sup>108</sup> The bite of those called *omodro* is very dangerous, and those who are bitten by it do not live one-half day. It is from that effect that it derives its name, for *odro* signifies one-half day. There is another very large snake called *saua*. I have killed one of that species which was two and one-half brazas long. The skin of another, which measured thirty-two [Spanish] feet in length, was brought to our residence at Manila. The sauas hang to the branches of trees along the roads, whence they dart down upon people, or deer, or on any other prey. They wind themselves three or four times around the body, and after having broken the creature's bones devour it. But God has provided a number of herbs in those islands which are used as antidotes to all kinds of poisons. Roots and herbs are found in the mountains, which are so many specific remedies against snake-bites; the chief ones are *manongal*, *manambo*, *logab*, *boroctongon*, *maglingab*, *ordag*, *balocas*, *bonas*, *bahay*, *igluhat*, *dalogdogan*, *mantala*.

John Francis Gemelli Careri writes: \*

There are Snakes of a prodigious Bigness. One sort of them call'd *Ibitin* which are very long, hang themselves by the Tail down from the Body of a Tree, expecting Deer, wild Boars, or Men to pass by, to draw them to them with their Breath, and swallow them whole; and then winds it self round a Tree to digest them. Some *Spaniards* told me, *The only Defence against them was to break the Air between the Man and the Serpent*; and this seems rational, for by that means, those Magnetick or attracting Particles spread in that distance are dispers'd. Another sort of Snake call'd *Assagua* eats nothing but Hens. That they call *Olopong*, is Venomous. The biggest are called *Bobes*, which sometimes are 20 or 30 Spans long.

Another sort of four footed Creature, which is also found in *America*, and devours Hens, is call'd *Iguana*. It is like an *Alligator*, the Skin Purple, speckled with Yellow Spots, the Tongue Cloven, but the Feet close and with Claws. Tho' a Land Creature, it passes over Rivers swiftly. The *Indians* and some *Spaniards* eat it, and say it tastes like a *Tortoise*.

Juan de Plascencia † writing in 1589 of the witch doctors says:

The second they called *mangagauay*, or witches, who deceived by pretending to heal the sick. These priests even induced maladies by their charms, which in proportion to the strength and efficacy of the witchcraft,

<sup>108</sup> For a treatise on the snakes and poisonous animals of the Philippines, see Delgado's *Historia*, pp. 889-907. He describes the *omodro* as the *odto* (*Hemibungarus collaris*)—from the word meaning "half-day" or "noon," and given to it because the bite proves fatal if given at noon, but at no other time. It is of various colors and very furious at the hour of noon. The *saua* (*Python reticulatus*) is the largest snake of the islands and is often domesticated, and is not poisonous to man. [Footnote in Blair and Robertson.]

\* A voyage round the world; in A Collection of Voyages. London 4 (1704) 454.

† Customs of the Tagalogs (two relations by Juan de Plascencia, O. S. F.) Manila, october 21, from Blair and Roberston, op. cit. 7 (1903) 192.

are capable of causing death. In this way, if they wished to kill at once they did so; or they could prolong life for a year by binding to the waist a live serpent, which was believed to be the devil, or at least his substance. This office was general throughout the land.

An Englishman writing in 1819-1822 \* says:

Their serpents, however, attain an enormous size: the largest are those of the Boa species (Constrictor), and will devour a horse or a cow at a meal.<sup>95</sup> Of this genus there is one variety very beautifully marked, which frequents the houses, and is called by the Spaniards (Culebra casera), the house snake,<sup>96</sup> and by the Indians "Sawa." These are often seen from 10 to 12 feet in length, but are very harmless. Few houses are without one or more of them in the cellars, stables, &c. but they are seldom disturbed, as they are said to devour rats and other noxious animals; though, when these fail them, they attack fowls, or even goats. They form a favourite article of food with the Chinese, who keep them in jars to fatten, and the Indians may be often seen carrying them through the streets for sale.

Of other varieties they have great numbers; some of which, as the "dahun-palay" or *leaf of rice*, of a deep green and yellow, which frequents the rice fields, and the "mandadalag," or whip-snake, are excessively venomous: accidents from these animals are not, however, very frequent; from whence it may be concluded, that the superstition of the natives has greatly exaggerated the number of venomous ones:

Aduarte † writing in 1690 says:

When he (Fray Juan Naya) was living in the district of Ytabes, in a village of that province named Tuao, he was once burying a dead man in the cemetery when a venomous snake came out from the grass and, amid the noise and alarm of the people, entered between his leg and his breeches—which was an easy thing for the snake to do, since these garments are worn loose in this province, and resemble *polainas*.<sup>25</sup> Although the Indians, who knew how poisonous the snake was, cried out and gave him over for dead, father Fray Juan continued with the act which he was performing, because of his duty as a religious, until he had finished burying the Indian; and then, putting his hand in his breeches, he caught the snake by the neck and drew it out and threw it away, without receiving any harm from it.

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\* Remarks on the Philippine Islands and on their capital Manila, 1819-1822. By an Englishman. From Blair and Robertson, op. cit. 51 (1907) 142.

<sup>95</sup> It is said by the Indians. [Footnote in Blair and Robertson.]

<sup>96</sup> Perhaps *Boa hortulana*? [Footnote in Blair and Robertson.]

† Historia de la Provincia del Santo Rosario de la Orden de Predicadores, by Diego Aduarte, O. P. translated by Blair and Robertson, op. cit. 32 (1905) 107, 108.

<sup>25</sup> A sort of trousers, generally made of cloth, covering the legs as far as the knees, buttoned or hooked together on the outside. It has also a dust-guard, which extends to the shoe. It is mainly used by laborers, carriers, and the like. (Dominguez's Diccionario Nacional.) [Footnote in Blair and Robertson.]

Father Mastrili,\* speaking of the capture of the Sultan's palace in Mindanao in 1636, says:

What we saw when we came to take out this throne certainly surprised us; for, before we reached the fire, two most venomous serpents came out from the feet of the chair, terrifying the soldiers greatly. And truly, nothing other than serpents and poison ought to guard the chair of the great devil of Mindanao.

Antonio Mozo † writes in 1763:

Among these [remedies] are the gall and fat of the python (called *saua* and *biting*, in various dialects) and another similar species of serpent, which reach an enormous size in the forests of the interior. The gall is used both internally and externally by the natives, to cure chills and pains in the stomach—to which they are especially liable from going barefooted, and more or less naked, through mud and rain at all times; also for malignant fevers and any inflammation which causes them. \* \* \* The fat of these serpents is equally efficient for swellings or pains in the muscles and sinews, especially those caused by chills and exposure to weather.

I do not know who made the earliest herpetological collection in the Philippines, but as early as 1829 Eschscholtz in his Zoölogical Atlas describes a sea turtle, *Chelonia olivacea*, from Manila Bay, and a large lizard, *Hydrosaurus pustulosus*, the species commonly known as *ibid* or *balubid* in the Philippines.

In 1835 Wiegmann ‡ described a new snake, *Elaps calligaster*, together with the lizards *Peropus mutilatus* and *Draco spilopterus*; and *Varanus salvator* is recorded as occurring in the Islands. This collection was made by F. J. F. Meyen.

Schlegel || must have had some Philippine material at hand in 1837 since he described in that year *Hemibungarus collaris*, a rare Philippine snake.

Hugh Cuming began his collecting in the Philippine Islands in 1836 and continued until 1840. He obtained about thirty-seven species of snakes and about twenty-nine species of lizards. From that time down to 1898 a number of important collections were made by the following men or expeditions: Wilkes Exploring expedition (1838–1842); expedition of the *Astrolabe* and *Zélée*; Friederich Jagor (1859–1861); Karl Semper (1858–1866); Adolph B. Meyer (1870–1873); A. Everett, John White-

\* Letter from Father Marcelo Francisco Mastrili to Father Juan de Zalazar, translated in Blair and Robertson, op. cit. 27 (1905) 269.

† Noticia histórico natural, translated by Blair and Robertson, op. cit. 48 (1907) 120.

‡ Nova Acta Acad. Leop.-Carol (1835) 253, pl. 25, fig 2.

|| Phys. Serp. 2 (1837).

head (1885 and 1890-1896); Von Moellendorf and Otto Koch (1886-1905); A. Schadenberg (1892?).

Since American occupation several important collections have been made. Those of Maj. Edgar A. Mearns, Maj. T. M. J. Partello, Dr. J. B. Steere, and Dr. J. C. Thompson have found their way into American museums. Those made by C. M. Weber, Willie Schultze, Richard C. McGregor, and Lawrence E. Griffin are contained in the Bureau of Science collections.

My own collection on which the bulk of this work is founded was made during 1912 to 1916. Specimens taken in 1917 to 1919 are in the Bureau of Science collections.

The collections in the University of Santo Tomás Museum and in El Ateneo de Manila date back for many years and were probably made by the numerous students in those institutions.

#### BIBLIOGRAPHY OF PHILIPPINE SNAKES

Only such titles as have a direct value in the systematic study of the Philippine forms have been included. A number of other works contain references to Philippine snakes, but most of these omitted works have no original systematic data.

**BARBOUR, THOMAS.** A contribution to the zoögeography of the East Indian Islands. Mem. Mus. Comp. Zool. Harvard College 44 (1912) 1-203, 8 pls.

A splendid piece of work on faunal relationships of the Malay Archipelago and the East Indian islands, with an annotated list of herpetological specimens collected or studied. There is appended a long series of tables of distribution which include species known to this territory. From the Philippines are listed 21 frogs, 18 lizards, 26 snakes, 1 turtle, and 1 crocodile.

Of the snakes, *Bungarus fasciatus* Schneider and *Trimeresurus sumatranus* Raffles are given in the tables as occurring in the Philippine Islands. The inclusion of the former species is probably an error; the latter is probably synonymous with *T. schultzei* Griffin.

**BOETTGER, OSKAR.** Aufzählung der von den Philippinen bekannten Reptilien und Batrachier. Ber. Senck. Nat. Ges. (1886) 91-134.

This paper, which as its title states is a check list of the turtles, crocodiles, lizards, snakes, and frogs, lists the following: Turtles, 5 species belonging to 5 genera and 3 families; Crocodiles, 2 species belonging to 1 genus and 1 family; Lizards, 48 species (including 2 subspecies) belonging to 18 genera and 4 families; Snakes, 85 species belonging to 40 genera and 18 families. Many of the species of snakes are incorrectly included in the list, and many are represented under more than one name. The work is merely a compilation from the works of other authors.

**BOETTGER, OSKAR.** Katalog der Reptilien-Sammlung im Museum der Senckenbergischen Naturforschenden Gesellschaft in Frankfurt am Main; I. Theil. (Rhynchocephalen, Schildkröten, Krokodile, Eidechsen, Chamæleons) Frankfurt am Main (1893).

A few Philippine specimens are listed.

BOETTGER, OSKAR. Ueber äussere Geschlechtscharactere bei den Seeschlangen. Zool. Anz. 11 (1888) 395-398.

Variations in three species of Philippine sea snakes are discussed. Eight species are listed from the Philippines.

BOETTGER, OSKAR. Neue Reptilien und Batrachier von den Philippinen. Zool. Anz. 20 (1897) 161-166.

*Lepidodactylus brevipes* from Samar, and *Lygosoma* (*Homolepida*) *moellendorffi* (= *Sphenomorphus moellendorffi* Boettger) from Tablas are the new lizards described. Two new snakes, *Typhlops ruber* and *Ablabes philippinus* (= *Liopeltis philippinus*), and a frog, *Kalophrynus acutirostris* (= *Kalophrynus acutirostris*), are also described.

BOETTGER, OSKAR. Ber. Senck. Nat. Ges. (1889) 26, lists a collection of reptiles from the Philippines collected by Moellendorff. *Fordonia unicolor* Gray is reported for the first time from the Philippines.

Idem, *ibid.* (1890) lxiii, lists a collection of reptiles and batrachians from Leyte, Philippine Islands.

Idem, *ibid.* (1892) xlix, lists Philippine snakes, with one record for Catanduanes of *Dipsas angulata* Peters. (= *Boiga angulata* Peters).

Idem, *ibid.* (1893) xxix, lists a collection of reptiles from Manila.

Idem, *ibid.* (1897) lv, lists a collection from Manila, Cebu, Samar, and Culion. *Lycodon aulicus capucina* Boie is listed from Cebu.

Idem, *ibid.* (1898) xxxviii, lists 5 specimens of *Disteira cyanocincta* from Lake Taal, Luzon.

Idem, *ibid.* (1905) 170, lists a collection from the Philippines, including 14 specimens of *Disteira cyanocincta* from Lake Taal.

Idem, *ibid.* (1906) 115, lists a few Philippine snakes.

BOIE. Isis (1827) 535, describes *Tropidonotus spilogaster* (= *Natrix spilogaster*.)

BOULENGER, GEORGE ALBERT. Catalogue of the Snakes in the British Museum of Natural History. London 1 (1893) i-xiii + 1-448, pls. 1-28; 2 (1894) i-xi + 1-382, pls. 1-20; 3 (1896) i-xiv + 1-727, pls. 1-25.

In vol. 1 *Stegonotus dumerilii* is renamed and drawings are given of the following: *Typhlops cumingii* Gray; *Tropidonotus auriculatus* (= *Natrix auriculata* Günther); *Oxyrhabdium leporinum* Günther; *Zaocys luzonensis* Günther. In vol. 2 drawings are given of *Oligodon modestus* Günther, *Calamaria everetti*, and *Typhlogeophis brevis* Günther. In vol. 3 *Hurria microlepis* and *Dryophiops philippina* are described. Drawings are given of these two species and of *Lachesis flavomaculatus* Gray. Many Philippine species are listed and described throughout the work.

BOULENGER, GEORGE ALBERT. On the herpetological fauna of Palawan and Balabac. Ann. & Mag. Nat. Hist. VI 14 (1894) 81-90.

There are listed 1 turtle, 7 lizards, 16 snakes, and 13 frogs. *Polyodontophis bivittatus* is described as new. *Trimeresurus formosus* Schlegel and *Trimeresurus subannulatus* Gray are listed. *Rana palawanensis*, *Rana varians*, *Rhacophorus everetti*, and *Ixalus longicrus* are described as new. Of the 37 species named, 14 are listed from Balabac. The following snakes are also listed:

*Tropidonotus spilogaster* Boie (= *Natrix spilogaster* Boie).

*Tropidonotus chrysargus* Schlegel (= *Natrix chrysargus* Schlegel).

*Coluber erythrurus* (= *Elaphe philippina* Griffin).

*Coluber oxycephalus* Boie (= *Gonyosoma oxycephala* Boie).

*Dendrophis pictus* Gmelin.

*Dipsas dendrophila* Schlegel (= *Boiga dendrophila multicincta* Boulenger).

*Psammodynastes pulverulentus* Boie.

*Cerberus rhynchops* Schneider (= *Hurria rhynchops* Schneider).

*Naia tripudians* Merrem (= *Naja naja miolepis* Boulenger).

*Adeniphis bilineatus* Peters (= *Doliophis bilineatus* Peters).

*Amblycephalus boa* Boie (= *Haplopetura boa* Boie).

*Trimeresurus formosus* Schlegel (= *Trimeresurus schultzei* Griffin).

*Trimeresurus subannulatus* Gray (= ? *Trimeresurus wagleri wagleri* Boie).

BOULENGER, GEORGE ALBERT. A catalogue of the reptiles and batrachians of Celebes with special reference to the collections made by Drs. P. & F. Sarasin in 1893-1896. Proc. Zool. Soc. London (1897) 193-237, pls. 7-11.

A list is given of species occurring in the Philippines that are also common to Celebes. A discussion of the faunal relations is added.

BOULENGER, GEORGE ALBERT. Description of two new snakes of the genus *Calamaria*. Ann. & Mag. Nat. Hist. VI 16 (1895) 481.

*Calamaria mindorensis* from the Everett collection is described from Mindoro.

CASTO DE ELERA. Catálogo sistemático de toda la fauna de Filipinas conocida hasta el presente, y á la vez el de la colección zoológica del Museo de PP. Dominicos del Colegio-Universidad de Sto. Tomás de Manila, escrito con motivo de la exposición regional Filipina. Manila, Imprenta del Colegio de Santo Tomás (1895-1896) 3 vols.

Volume 1 (1895), Vertebrados, devotes pages 399 to 454 to a list of the crocodilians, batrachians, turtles, lizards, and snakes. Among the species of snakes listed a great many records have not been authenticated. It is not improbable that Casto de Elera had before him a collection of snakes from southern Asia, or other extra-Philippine localities, which purported to come from the Philippine Islands. At the present time, however, there are no foreign snakes in the collections of the University of Santo Tomás.

CATANJAL, ANDRES. Report on the poisonous snakes in the Philippines, pp. 1-45. [Manuscript.] An interesting work prepared for the Philippine Bureau of Health. Contains pertinent data on deaths caused from the bites of poisonous snakes. It gives a list of native names of snakes supposedly poisonous, and records various real or superstitious medicines and cures.

COPE, EDWARD DRINKER. Proc. Acad. Nat. Sci. Philadelphia (1860) 244, 245.

*Simotes phænochalinus* (= *Holarchus ancorus* Girard) and *Simotes aphanospilus* (= *Holarchus ancorus* Girard) are described as new. A few other Philippine snakes are listed.

DUMÉRIL, A. M. C., and BIBRON, G. Erpétologie général ou histoire naturelle complète des reptiles (1834-1854) 9 vols.

Volume 7 contains the following original descriptions: *Calamaria gervaisii*, p. 76; *Lycodon mülleri* (= *Stegonotus muelleri* Duméril

and Bibron) p. 382; *Stenognathus modestus* (= *Oxyrhabdium modestum* Duméril and Bibron) p. 503; *Leptophis vertebralis* (=?) p. 543. *Leptophis vertebralis*, if from the Philippines is probably a species of *Natrix*. Their specimen of *Campylodon prevostianum*, p. 964, probably originated in southern India and not in Manila.\*

FISCHER, J. G. A list of reptiles and batrachians of Mindanao. *Jahrb. wiss. Anst. Hamburg* 2 (1885) 80 pls.

*Geophis schadenbergi* (= *Oxyrhabdium modestum* Duméril and Bibron) and *Trimeresurus schadenbergi* (= *Trimeresurus flavomaculatus* Gray) are described as new. Twenty-one other species are listed from southern Mindanao. *Geophis schadenbergi* is figured, pl. 3, fig. 4.

GARMAN, SAMUEL. New and little-known reptiles and fishes in the museum collections. *Bull. Mus. Comp. Zool. Harvard Coll.* 8 (1881) 85-93.

*Hydrophis semperi* is described as a new species from "Lake Taal, Luzon Island, Philippines" from a specimen collected by Dr. Carl Semper. Boulenger recognizes this as a distinct species.

GIRARD, CHARLES. *Proc. Acad. Nat. Sci. Philadelphia* (1857) 196.

Describes the lizard *Leiopisma vulcania* under the name *Lipinia vulcania*, and *Holarchus ancorus* under the name *Xenodon ancorus*.

GIRARD, CHARLES. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U. S. N., Vol. XX., Herpetology. With folio Atlas. Philadelphia, J. B. Lippincott and Co. (1858) i-xvii and 1-496.

Lists 2 frogs, 1 snake, and 5 lizards from the Philippines. The snake is *Xenodon ancorus* Girard (= *Holarchus ancorus* Girard).

GOGORZA Y GONZALES, JOSÉ D. Datos para la fauna Filipina; Vertebrados; Madrid, Imprenta de Fortaner (1888) 57 pages. Extract from *Anal. de la Soc. Esp. de Hist. Nat.* 17 (1888).

This paper lists 87 reptiles and 10 amphibians. Pages 30 to 34 give a list of 51 Philippine snakes in the Museo de Ciencias Naturales de Madrid. Fourteen of these are referred only to the genera. A species is referred to the genus *Aspidura* from Angat, Bulacan. This is an error, as the genus is confined to Ceylon. Another species is referred to *Oxybelis*, a genus confined to South America. The following species if correctly identified probably did not originate in the Philippines: *Calamaria vermiformis* Duméril and Bibron; *Coryphodon korros* Reinwardt; *Tragops nasutus* Wagler; *Dipsas drapiezii* Duméril and Bibron; and *Hydrophis schistosus* Daudin. The list is obviously rather untrustworthy.

GRAY, JOHN EDWARD. *Zool. Miscellany* (1842) 48 to 50.

Describes *Megæra flavomaculatus*, *Megæra ornata*, *Megæra variegata*, *Trimeresurus subannulatus*, and *Trimeresurus philippensis*.

The first three species are referred to *Trimeresurus flavomaculatus* Gray; *Trimeresurus subannulatus*, to *Trimeresurus wagleri*. The specimens are from the Cuming Philippine collection; the exact localities are not given.

GRAY, JOHN EDWARD. *Ann. & Mag. Nat. Hist.* 11 (1843) 46.

Describes *Lapemis loreata* (= *Lapemis hardwickii* Gray).

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\* See Boulenger, *Fauna Brit. India, Rept.* (1890) 380.

GRAY, JOHN EDWARD. Catalogue of Lizards in the British Museum. London (1854).

The following species of snakes are described as new from the Philippines: *Argyrophis truncatus* Gray (= *Typhlops braminus* Daudin); *Anilius ruficauda* Gray (= *Typhlops ruficauda* Gray); *Onychophis olivaceus* Gray (= *Typhlops olivaceus* Gray); *Onychophis cumingii* Gray (= *Typhlops cumingii* Gray). These species are founded on specimens in the Cuming collection from the Philippines.

GRAY, JOHN EDWARD. Catalogue of Viperine Snakes in the British Museum (1849).

Records *Parias flavomaculatus* Gray, *Parias ornata* Gray, *Parias variegata* Gray, and *Trimeresurus philippensis* Gray, on pages 9 and 10.

GRIFFIN, LAWRENCE E. Two new species of snakes found in the Philippine Islands. Philip. Journ. Sci. § A 4 (1909) 55, 56.

*Dendrelaphis cæruleatus* and *D. fuliginosus* are described as new. These forms are probably synonymous with *D. terrificus* and *D. modestus*, respectively.

GRIFFIN, LAWRENCE E. A list of snakes found in Palawan. Philip. Journ. Sci. § A 4 (1909) 595-601.

*Dryocalamus philippinus*, *Elaphe philippina*, *Oligodon iwahigensis*, and *Trimeresurus schultzei* are described as new. The first records for the Philippines for *Liopeltis tricolor* Schlegel and *Trimeresurus gramineus* are included. I question the correctness of the latter record. Thirty-two species and 2 subspecies are listed, based on the collection of Everett (studied by Boulenger), and those of H. M. Weber and W. Schultze which are now in the Bureau of Science collection.

GRIFFIN, LAWRENCE E. A list of snakes from the Island of Polillo, P. I., with descriptions of a new genus and two new species. Philip. Journ. Sci. § D 5 (1910) 211-218, pl. 1, 1 text fig.

*Haplonodon* is the new genus, with *H. philippinensis* as its type. *Trimeresurus halieus* is also described as new. Fourteen other species are listed.

GRIFFIN, LAWRENCE E. A check-list and key of Philippine snakes. Philip. Journ. Sci. § D 6 (1911) 253-268.

Lists 94 species and subspecies of snakes, based largely on the Philippine Bureau of Science collection. *Xenopeltis unicolor* Reinwardt and *Zaocys carinatus* Günther are reported for the first time from the Philippines. The following species are eliminated from Griffin's checklist or their nomenclature changed by the present work:

*Holarchus octolineatus* (Schneider). Philippine snakes referred to this species should probably be *Holarchus meyerlinkii*.

*Holarchus phænochalinus* (Cope) (= *H. ancorus* Girard).

*Dendrophis punctulata* (Gray), included apparently only on the record of Parenti and Picaglia, which appears to be incorrect.

*Elaphe oxycephala* (Boie) (= *Gonyosoma oxycephala* Boie).

*Ablabes tricolor* (Schlegel) (= *Liopeltis tricolor*).

*Ablabes philippina* (= *Liopeltis philippina*).

*Dendrelaphis cæruleatus* Griffin (= ? *D. terrificus* Peters).

*Dendrelaphis fuliginosus* Griffin (= ? *D. modestus* Boulenger).

*Gerardia prevostiana* (Eydoux et Gervaise), included by Griffin on Duméril and Bibron's record which appears incorrect).

*Naja naja cæca* (Gmelin) (= *N. n. philippinensis*).

*Trimeresurus sumatranus* (Raffles) (= *T. schultzei* Griffin).

GUICHENOT, A. In Dumont d'Urville Voyage Pôle Sud et Océanie, Zool., Rept. (1853).

Describes *Tropidolæmus hombroni* (= *Trimeresurus philippensis* Gray) p. 23, pl. 2, fig. 2, from Zamboanga.

GÜNTHER, ALBERT. Catalogue of Colubrine Snakes in the Collection of the British Museum, London (1858) i-xvi + 1-281.

A new genus, *Hologerrhum*, with the type *Hologerrhum philippinum*, is described. The following species are described as new from the Philippines: *Calamaria grayi*; *Rhabdosoma leporinum* (= *Oxyrhabdium leporinum*); *Rhabdosoma oxycephalum* (= *Pseudorhabdium oxycephalum*). The following species are listed from the Philippines:

*Calamaria gervaisii* Duméril and Bibron.

*Calamaria lumbricoidea* part (= *Calamaria grayi* Günther).

*Simotes purpurascens* Schlegel var. C. (= *Holarchus ancorus* Girard).

*Tropidonotus spilogaster* Boie (= *Natrix spilogaster* Boie).

*Tropidonotus chrysargus* (= *Natrix chrysargus* Boie).

*Elaphis subradiatus* Schlegel (= *Elaphe erythrurus* Duméril and Bibron).

*Spilotes melanurus* Schlegel (= *Elaphe philippina* and *erythrurus*).

*Gonyosoma oxycephalum* Reinwardt.

*Psammodynastes pulverulentus* Boie.

*Crysopelea ornata* Shaw.

*Dendrophis pictus* Gmelin.

*Crysopelea rubescens* Gray (= *Dryophiops philippina* Boulenger).

*Dendrophis punctulata* (= *Dendrelaphis terrificus* Peters).

*Dryophis prasina* Reinwardt.

*Eudipsas cynodon* Cuvier (= *Boiga cynodon* Cuvier).

*Dipsas dendrophila* (= *Boiga dendrophila*).

*Amblycephalus boa* Kuhl (= *Haplopeltura boa* Kuhl).

*Lycodon aulicus* Linnæus (= *Ophites aulicus* Linnæus).

*Lycodon mulleri* Duméril and Bibron (= *Stegonotus dumerilii* Boulenger).

*Cyclocorus lineatus* Reinhardt.

*Hamadryas elaps* Schlegel (= *Naja hannah* Cantor).

*Naja tripudians* var. F. Merrem (= *Naja naja samarensis* Peters).

*Elaps calligaster* Wiegmann (= *Hemibungarus calligaster* Wiegmann).

*Elaps intestinalis* var. (= *Doliophis philippinus* Günther).

*Platurus laticaudatus* (= *Laticauda colubrina* Schneider).

These identifications refer only to Philippine records.

GÜNTHER, ALBERT. On the genus *Elaps* Wagler. Proc. Zool. Soc. London (1859) 79-89.

*Callophis intestinalis* Laurenti var. A. (= *Doliophis philippinus* Günther) is figured and described.

GÜNTHER, ALBERT. The reptiles of British India. London (1864) i-xxvii + 1-452, pls. 1-26.

An extensive treatise on the reptiles of India and southern Asia. *Oligodon modestus* is described as new from the Philippines. The

following are attributed to the Philippines, and a few other forms are mentioned as occurring in the Philippines:

*Ophiophagus elaps* (= *Naja hannah* Cantor).

*Chersydrus granulatus*.

*Dipsas cynodon* (= *Boiga cynodon* Cuvier).

*Hydrophis loreata* Gray (= *Lapemis hardwickii* Gray).

*Caliophis intestinalis philippina* Günther (= *Doliophis philippinus* Günther).

GÜNTHER, ALBERT. Notes on some reptiles and batrachians obtained by Dr. Adolph Bernhard Meyer in Celebes and the Philippine Islands. Proc. Zool. Soc. London (1873) 165-172, pls. 17, 18.

Ten Philippine lizards are listed, with copious notes. A drawing of the head of *Sphenomorphus jagori* Peters is given under the name *Hinulia variegata*. The snakes *Oligodon notospilus* from Mindanao and *Zaocys luzonensis* from Luzon are described as new. *Hologerrhum philippinum* Günther and *Oligodon notospilus* are figured by complete drawings, and *Pseudorhabdium oxycephalum* Günther by three text figures under the name *Oxycalamus oxycephalus*. Six snakes are listed.

GÜNTHER, ALBERT. List of the mammals, reptiles, and batrachians sent by Mr. Everett from the Philippine Islands. Proc. Zool. Soc. London (1879) 74-79, pl. 4.

Lists 1 tortoise, 1 crocodile, 20 lizards, 17 snakes, and 7 frogs. A new genus of snakes, *Typhlogeophis*, is described, with *T. brevis* as the type. *Dendrophis philippinensis* is described as new; this is *Dendrelaphis terrificus* Peters. A good drawing is given of this species. The type locality of both these species is northern Mindanao (possibly Dinagat in the case of the former species). The other species reported are:

*Calamaria gervaisii* Duméril and Bibron.

*Rhabdosoma modestum* Duméril and Bibron (= *Oxyrhabdium modestum* Duméril and Bibron).

*Oligodon modestus* Günther.

*Odontomus muelleri* Duméril and Bibron (= *Stegonotus muelleri* Duméril and Bibron).

*Spilotes melanurus* Schlegel (= *Elaphe erythrurus* Duméril and Bibron).

*Tragops prasinus* Reinwardt (= *Dryophis* sp.).

*Dipsas dendrophila* Reinwardt (= *Boiga dendrophila latifasciata* Boulenger).

*Dipsas cynodon* Cuvier (= *Boiga cynodon* Cuvier).

*Hologerrhum philippinum* Günther.

*Psammodynastes pulverulentus* Boie.

*Lycodon aulicus* Linnæus (= *Ophites aulicus* Linnæus).

*Cerberus rhynchops* Schneider (= *Hurria rhynchops* Schneider).

*Naja tripudians* (= ? *Naja naja philippinensis* subsp. nov.).

*Trimeresures wagleri* Schlegel.

*Trimeresurus flavomaculatus* Gray.

Most of these species are from northeastern Mindanao, and from Dinagat; a few are from Negros and Leyte.

GÜNTHER, ALBERT. Descriptions of two snakes from the "Challenger" collections. Ann. & Mag. Nat. Hist. V 11 (1883) 136, fig.

*Tropidonotus dendrophlops* (= *Natrix dendrophlops* Günther) is described from Zamboanga, Mindanao.

JAN, G. Elenco sistematico, degli Ofidi. Milan (1863).

The following species are described or listed from the Philippines: *Lycodon tessellatus* (= *Ophites tessellatus* Jan).

*Hydrophis abbreviatus* and *Hydrophis brevis* (= *Lapemis hardwickii* Gray).

*Hydrophis westermanni* (= *Disteira cyanocincta* Daudin).

*Tropidonotus spilogaster* Boie (= *Natrix spilogaster* Boie).

*Composoma melanurum* (= *Elaphe erythrurus* Duméril and Bibron).

JAN, G. Iconographie general des ofidiens. Milan (1860-1881).

Livr. 10 (1865), pl. 2, fig. 1, *Calamaria gervaisii*.

Livr. 21 (1867), pl. 4, fig. 2, *Composoma melanurum manillensis* (= *Elaphe erythrurus* Duméril and Bibron).

Livr. 27 (1868), pl. 2, fig. 1, *Natrix spilogaster* Boie.

Livr. 30 (1868), pl. 6, fig. 3, *Campylodon prevostianum* Duméril and Bibron (= *Gerardia prevostianum* Duméril and Bibron).

Livr. 36 (1870), *Lycodon tessellatus* (= *Ophites tessellatus* Jan).

Livr. 39 (1872), pl. 5, fig. 1, *Hydrophis westermanni* (= *Disteira cyanocincta* Daudin).

Livr. 41 (1872), *Hydrophis nigrocinctus* (= *Disteira spiralis* Shaw).

MEYER, A. B. Mon. Berl. Ak. (1869).

*Hemibungarus calligaster* is listed from the Philippines.

MEYER, A. B. Sitzb. Akad. Berl. (1886).

*Adenophis philippinus* is described on page 614.

MÜLLER, F. Katalog der Herpetologischen Sammlung des Basler Museums (1878). I. Nachtrag Catalog der Herpetologischen Sammlung des Basler Museums (1880). II. Nachtrag Cat. Herp. Samml. Basler Mus. (1882). III. Nachtrag Cat. Herp. Samml. Basler Mus. 1883. IV. Nachtrag Cat. Herp. Samml. Basler Mus. (1885).

In the catalogue and the various supplements a few species of Philippine reptiles are given. Most of the Philippine specimens are listed in the third supplement.

MÜLLER, F. Verh. Nat. Ges. Basel. 17 (1883).

*Callophis gemianulis* (= *Hemibungarus calligaster* Wiegmann) is described on page 289.

PARENTI, P., and PICAGLIA, L. Rettili ed anfibii raccolti da P. Parenti nel viaggio di circumnavigazioni della r. corruetta "Vettor Pisani" negli anni 1882-85, e da V. Ragazzi sulle coste del mar rosso e dell' America meridionale negli anni 1879-84. Atti. Soc. Nat. Modena, Mem. Orig. III 5 (1886) 1-96.

This paper lists a number of reptiles from Ticao Island. Many of the identifications are very untrustworthy. The following species are listed:

*Hemidactylus frenatus* Duméril and Bibron.

*Spathoscalabotes mutilatus* Günther (= ? *Hemiphyllodactylus insularis* Taylor).

*Lophura amboinensis* Schlosser.

*Gecko japonicus* (= ?).

*Monitor chloristigma* (= ?).

*Dendrophis punctulata* Gray (= ?).

*Dendrophis terrificus* Peters.

*Dendrophis octolineata* (= *Dendrelaphis terrificus* Peters).

*Rhacophorus maculatus* Gray (= *Polypedates leucomystax* Gravenhorst).

PETERS, W. Report on collections of F. Jagor in Malacca, Java, Borneo, and the Philippines, second report. Mon. Berl. Ak. (1861) 683-691.

The following Philippine species are reported, mostly from southern Luzon and from Samar and Leyte:

*Typhlops braminus* Daudin.

*Typhlops* (*Anilius*) *ruficauda* Gray.

*Typhlops jagorii*, described as new from Isarog Volcano, southern Luzon.

*Onychocephalus* (*Onychophis*) *olivaceus* Gray (= *Typhlops olivaceus* Gray).

*Python reticulatus* Schneider.

*Chersydrus granulatus* Schneider.

*Calamaria Gervaisii* Duméril and Bibron.

*Stenognathus modestus* Duméril and Bibron (= *Oxyrhabdium modestum* Duméril and Bibron).

*Plagiodon erythrurus* Duméril and Bibron (= *Elaphe erythrura* Duméril and Bibron).

*Composoma melanurum* Schlegel (= *Elaphe erythrurus* Duméril and Bibron).

*Spilotes Samarensis* is described as new (= *Stenognathus muelleri* Duméril and Bibron).

*Tropidonotus stolatus* Linnæus (= ? *Natrix stolata* Linnæus).

*Tropidonotus lineatus* (= *Natrix lineata* Peters) is described as new from Loquilocun, Samar.

*Tripodonotus spilogaster* Boie (= *Natrix spilogaster* Boie).

*Tropidonotus auriculatus* Günther (= *Natrix auriculatus* Günther).

*Cerberus boaeformis* Schneider (= *Hurria rhynchops* Schneider).

*Psammodynastes pulverulentus* Boie.

*Chrysopelea ornata* Boie.

*Dendrophis pictus* Reinwardt.

*Dendrophis caudolineatus* Gray (= *Dendrelaphis terrificus*) Peters.

*Dryophis prasinus* Reinwardt (= *Dryophis* sp. Cope ?).

*Gonyosoma oxycephalum* Reinwardt.

*Lycodon aulicus* Linnæus (= *Ophites aulicus* Linnæus).

*Lycodon Mülleri* Duméril and Bibron (= *Stenognathus dumérilii* Boulenger).

*Cyclocorus lineatus* Reinwardt.

*Dipsas* (*Dipsadomorphus*) *angulata* (= *Boiga angulata*) is described as new from Leyte.

*Elaps calligaster* Wiegmann (= *Hemibungarus calligaster* Wiegmann).

*Naja* (*Hamadryas*?) *fasciata* is described as new from Samar. This is probably the young of *Naja hannah*.

*Naja tripudians samarensis* is described as a new variety from Samar (= *Naja naja samarensis* Peters).

*Platurus fasciatus* Daudin (= ? *Laticauda laticaudatus* Linnæus).

*Bothrops viridis* (= *Trimeresurus* sp.).

*Tropidolaemus subannulatus* Gray and var. *maculatus* Gray (= *Trimeresurus wagleri* Boie).

*Tropidolaemus Philippinensis* Gray (= *Trimeresurus philippensis* Gray).

PETERS, W. Herpetological notes, Mon. Berl. Ak. (1867) 13-37.

The following snakes are listed from the Philippines: *Tragops prasinus* Boie (= *Dryophis* sp.); *Dipsas Philippina* (= *Boiga philippina*) (described as new from Ylases, northwest of Luzon); *Tropidolaemus Hombroni* Guichenot (= ? *Trimeresurus philippensis* Gray). These specimens were taken by Semper. A few new lizards and frogs are described as new.

PETERS, W. Mon. Berl. Ak. (1872) 585-587.

Reports upon 3 new species of snakes, *Calamaria bitorques*, *Stenognathus brevirostris*, and *Hemibungarus gemianulus* from the Philippines. *Stenognathus brevirostris* Peters (= *Oxyrhadium leporinum* Günther); *Hemibungarus gemianulus* Peters (= *Hemibungarus calligaster* Wiegmann). These specimens were collected by Wallis in the Philippines; the exact localities are not recorded.

PETERS, W. Sitz. Ber. Ges. Nat. Freunde, Berlin (1881) 109.

*Callophis bilineatus* (= *Doliophis bilineatus* Peters), from Palawan, is described.

REINHARDT, J. T. Kgl. Dansk. Vid. Afhand. (1843).

Describe *Lycodon lineatus* (= *Cyclocorus lineatus* Reinhardt).

ROSARIO Y SALAS, ANACLETO DEL. Los ofideos venenosos mas comunes en el pais. [From a typed copy of original manuscript.]

This paper was published by La Real Sociedad Económica de Amigos del Pais in Manila. It contains a juvenile attempt at a classification of Philippine snakes, and gives certain supposed cures for snake bites.

He gives the name *Furina philippinensis* to a snake known in the native dialect as *taling-bilauo* which, from the description, probably applies to *Hemibungarus calligaster* Wiegmann. The description is as follows: "Escamas iguales y pequeñas, gastrotegas sencillas y urostegas dobles; vientre blanco amarillento; cuerpo con fondo del mismo color y unas noventa y seis fajas negras trasversales, matizadas en su centro y por los lados por escamas amarillentas; partes laterales del cuerpo constituidas por escamitas amarillentas orilladas de negro y con rayitas longitudinales también negras y que unen el ángulo anterior con el posterior; cola delgada, larga y cónica; cabeza casi tan grande como el cuerpo con nueve placas que afectan igual disposición que las del *Dahunpalay* (*Tragops Xanthozonius*); ojos grandes y horizontales; hocico romo; ambos maxilares armados de numerosos dientes; los supra-maxilares anteriores surcados pero no perforados, delgados y mas largos que los posteriores que son en número de seis a ocho por lado."\*

SCHLEGEL, H. Essai sur la physionomie des serpens. The Hague (1837) 2 vols.

*Elaps collaris* (= *Hemibungarus collaris*) is described from the Philippines. The species is figured in Schlegel, Abbild. (1844) 137, pl. 46, figs. 10 and 11.

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\* From the original manuscript.

- SEOANE, VICTOR LOPEZ. Neue Boidengattung und Art von den Philippinen. Abh. Senck. Nat. Ges. (1881) 12. [Author's separate, pp. 1-7, pl. 1.] Describes a new genus *Piesigaster* with the species *Piesigaster boettgeri* from "der Provinz Iloilo und Pollock auf der Insel Mindanao," supposedly captured there by a brother of the author, a ship's captain of the Royal Spanish Marine. The specimen is *Epicrates inornatus* Reinhardt from the West Indies.
- STEINDACHNER, F. Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologischer Theil. Reptilien, Wien (1867) 98 pp. 3 pls.; Amphibien, Wien (1867) 70 pp. 5 pls. One new species *Gymnodactylus philippinicus* is described, and a few others are listed from the Philippines. The following Philippine snakes are described as new: *Dipsas guiraonis* (= *Boiga angulatus* Peters); *Lycodon bairdi* (= *Psammodynastes pulverulentus* Boie). Five other Philippine snakes are recorded.
- STEINDACHNER, F. Verh. Zool. Bot. Ges. Wien (1867). Describes *Calamaria philippinica*, p. 514, pl. 13, figs. 4-6, and *Typhlops petersi*, p. 515, pl. 13, figs. 7-9. The first is a synonym of *Calamaria grayi* Günther; the second is probably *Typhlops ruficauda* Gray.
- STEINDACHNER, F. Sitzb. Akad. Wien, c. (1891). Describes *Simotes meyerlinkii* (= *Holarchus meyerinkii*), page 294.
- STEJNEGER, LEONHARD. A new calamarine snake from the Philippine Islands. Smithson. Misc. Coll. (1908) 50. Describes *Calamaria nearnsi* from Mindanao.
- TAYLOR, EDWARD H. Snakes and lizards known from Negros, with descriptions of new species and new subspecies. Philip. Journ. Sci. § D 12 (1917) 353-382, 2 pls., 2 text figs. Twenty-four snakes and 24 lizards are listed. Two new species and 3 new subspecies of snakes, and 4 new lizards are described. The snakes are *Typhlops canlaonensis*, *Natrix dendrophiops negrosensis*, *Pseudorhabdium menamaræ*, *Calamaria gervaisii iridescens*, and *Trimeresurus wagleri albobiridis*. All are from Mount Canlaon, in central northern Negros.
- TAYLOR, EDWARD H. Reptiles of the Sulu Archipelago. Philip. Journ. Sci. § D 13 (1918) 233-267, 3 pls., 11 text figs. Six new lizards and 1 new snake are described in this paper. The snake is *Typhlops suluensis* from Bubuan Island, Sulu. Fifteen snakes are listed. The following changes are necessary: *Ablabes tricolor* (= *Liopeltis tricolor* Schlegel); *Elaphe erythrura* Duméril and Bibron (= *Elaphe philippina* Griffin); *Calamaria gervaisii* Duméril and Bibron (= *Calamaria suluensis* sp. nov.); *Laticauda colubrina*, part., Schneider (= *Laticauda laticaudata* Linnaeus).
- TAYLOR, EDWARD H. Two new snakes of the genus *Holarchus* with descriptions of other Philippine species. Philip. Journ. Sci. § D 13 (1918) 359-369, 2 pls. Two new snakes, *Holarchus burksi* and *Holarchus maculatus*, are described as new.
- TAYLOR, EDWARD H. New or rare Philippine reptiles. Philip. Journ. Sci. 14 (1919) 105-125, 2 pls., 2 text figs.

The following species of snakes are described as new from the Philippines: *Typhlops luzonensis*, *Typhlops manilæ*, *Typhlops rugosa*, *Typhlops longicauda*, and *Trimeresurus mcgregori*. Four new lizards are also described.

VAN DENBURGH, JOHN, and THOMPSON, J. C. A new sea snake. Proc. Cal. Acad. Sci. IV 3 (1908), 41-47, 1 pl.

*Disteira cincinnatii* is described from Manila Bay.

WIEGMANN, AREND FRIEDRICH AUGUST. Lists and descriptions of Amphibia collected during the voyage. Nova Acta Acad. Leop.-Carol. 17<sup>1</sup> (1835) 253, pl. 25, fig. 2. Reprinted in Meyen, F. J. F., Reise um die Erde 3 (1834-43).

Describes *Elaps calligaster* (= *Hemibungarus calligaster* Wiegmann) and *Natrix crebripunctata*. From specimens collected by F. J. F. Meyen.

El Archipiélago Filipino. Colección de datos geográficos, estadísticos, cronológicos y científicos, relativos al mismo entresacados de anteriores obras u obtenidos con la propia observación y estudio, por algunos Padres (Jesuitos). Washington, Imprenta del Gobierno 1 (1900). Tratado IX, Capítulo III. Reptiles y Batracios.

This chapter treats of the reptiles and batrachians of the Islands. Several interesting notes are given on snakes. *Python molurus* Gray, *Typhlops diardii*, *Typhlops ater* Schlegel, and *Uropeltis philippinus* Cuvier are wrongly attributed to the Philippines. A few lizards are mentioned. On the whole the account is rather untrustworthy.

#### ECONOMIC CONSIDERATION OF SNAKES

Many of the Philippine snakes are poisonous, and many deaths result each year from snake bite. Unfortunately no accurate records have been kept in the Philippines of the actual number. In 1912 Andres Catanjal, a health officer of Tarlac Province, P. I., prepared a work which he designated a report on the poisonous snakes in the Philippines. This work, which is still in manuscript form, gives statistics of deaths caused from poisonous snakes during 1909. As these figures appear to be accurate I shall utilize his work.\*

TABLE 1.—Distribution by provinces of deaths from poisonous snakes during 1909 in the Philippines.

|              |    |                 |    |
|--------------|----|-----------------|----|
| Cagayan      | 3  | Tarlac          | 6  |
| Isabela      | 1  | Laguna          | 3  |
| Ilocos Norte | 18 | Batangas        | 13 |
| Ilocos Sur   | 5  | Ambos Camarines | 1  |
| La Union     | 2  | Albay           | 9  |
| Pangasinan   | 16 | Bohol           | 2  |
| Nueva Ecija  | 6  | Misamis         | 1  |

It will be seen that 86 deaths were reported in 1909 from the fourteen provinces listed above. It is impossible to believe

\* For the most part it is impossible to make direct quotations from this work, but the statistical facts here set down are extracted therefrom.

that these reports cover all of the deaths that actually occurred during 1909 in the provinces listed. Undoubtedly many occur among the hill peoples of northern and central Luzon that are never brought to the attention of the municipal authorities.

TABLE 2.—*Showing relation of deaths to density of population.*<sup>a</sup>

| Province.            | Deaths<br>in 1909. | Square<br>miles. | Popula-<br>tion,<br>March,<br>1903. | Deaths<br>per<br>100,000<br>inhab-<br>itants. | Square<br>miles for<br>each<br>death. |
|----------------------|--------------------|------------------|-------------------------------------|---|---------------------------------------|
| Ilocos Norte.....    | 18                 | 1,330            | 178,995                             | 10.05   | 74.88                                 |
| Pangasinan.....      | 16                 | 1,193            | 397,302                             | 4.02  | 74.50                                 |
| Batangas.....        | 13                 | 1,201            | 257,715                             | 5.04  | 92.38                                 |
| Albay.....           | 9                  | 1,783            | 240,326                             | 3.79  | 198.11                                |
| Nueva Ecija.....     | 6                  | 2,169            | 134,147                             | 4.47  | 361.50                                |
| Tarlac.....          | 6                  | 1,205            | 135,107                             | 4.44  | 200.83                                |
| Ilocos Sur.....      | 5                  | 471              | 187,411                             | 2.66  | 94.20                                 |
| Laguna.....          | 3                  | 629              | 148,606                             | 2.01  | 209.66                                |
| Cagayan.....         | 3                  | 5,052            | 156,239                             | 1.92  | 1,684.00                              |
| La Union.....        | 2                  | 634              | 137,839                             | 1.45  | 817.00                                |
| Bohol.....           | 2                  | 1,511            | 269,223                             | 0.74  | 755.50                                |
| Isabela.....         | 1                  | 5,018            | 76,431                              | 1.30  | 5,018.00                              |
| Misamis.....         | 1                  | 3,777            | 175,683                             | 0.56  | 3,777.00                              |
| Ambos Camarines..... | 1                  | 3,279            | 239,405                             | 0.41  | 3,279.00                              |
| Total.....           | 86                 | 29,252           | 2,735,029                           |   |                                       |
| Average.....         |                    |                  |                                     | 3.14  | 340.00                                |

<sup>a</sup> This is a combination of Tables A and B of Catanjal's work.

From this table it appears that the largest number of deaths occurs in the more thickly populated districts, especially in the provinces where rice is raised to a large extent.

Thus we find an average of 3.14 deaths for each 100,000 inhabitants, and an average of 1 death for each 340 square miles. By applying these percentages to the entire population and to the entire territory of the Islands, we arrive at an approximate number of deaths for the Islands.

Taking the population in 1909 as 8,000,000 and the average deaths per 100,000 at 3.14, the estimate for the Islands is 251 deaths annually. Based on the total area of the Islands, approximately 144,000 square miles, with one death for each 340 square miles, the larger estimate of 335 deaths is reached. Since we observe from the table that the number of deaths appears to be directly increased by density of population, an estimate based on population is probably better than one based on territory.

Table 3 is a copy of Catanjal's Table E, and shows the distribution of the snakes that caused the 86 deaths reported. I quote the table in full.

TABLE 3.—Deaths by poisonous snakes locally named.

| Province.            | Alum-ag-in. | Alu-pung. | Cama-malu. | Cara-saen. | Jagua-son. | Romu-ranon. | Zadio-co. | Ulu-pung. | Un-known | Total. |
|----------------------|-------------|-----------|------------|------------|------------|-------------|-----------|-----------|----------|--------|
| Cagayan.....         | 1           |           |            |            |            |             |           |           | 2        | 3      |
| Isabela.....         |             |           |            |            |            |             |           |           | 1        | 1      |
| Ilocos Norte.....    |             |           |            | 8          |            |             |           |           | 10       | 18     |
| Ilocos Sur.....      |             |           |            |            |            |             |           |           | 5        | 5      |
| La Union.....        |             |           |            | 2          |            |             |           |           |          | 2      |
| Pangasinan.....      |             |           |            | 5          |            |             | 4         |           | 7        | 16     |
| Nueva Ecija.....     |             |           |            |            |            |             |           | 6         |          | 6      |
| Tarlac.....          |             | 1         | 2          | 2          |            |             |           |           | 1        | 6      |
| Laguna.....          |             |           |            |            |            |             |           |           | 3        | 3      |
| Batangas.....        |             |           |            |            |            |             |           |           | 13       | 13     |
| Ambos Camarines..... |             |           |            |            |            | 1           |           |           |          | 1      |
| Albay.....           |             |           |            |            |            | 9           |           |           |          | 9      |
| Bohol.....           |             |           |            |            |            |             |           |           | 2        | 2      |
| Misamis.....         |             |           |            |            | 1          |             |           |           |          | 1      |
| Total.....           | 1           | 1         | 2          | 17         | 1          | 10          | 4         | 6         | 44       | 86     |

It has been impossible to determine exactly from the native names the species of snakes in question here.

*Carasaen* is the name usually applied by the Ilocanos to species of the cobra, *Naja hannah* and *Naja naja*.

*Alupung* and *ulupung* are Tagalog names applied to the same species, while *jaguason* is the Mindanao-Visayan name applied to *Naja naja samarensis* and possibly to other cobras. *Cama-malu* \* is applied to cobras in the Pampanga dialect, while *tadioco* (according to Catanjal) is used in Pangasinan to designate the same species. In the Bicol provinces the name is applied to species of *Trimeresurus*.

*Romuranon*, according to Peters,† is applied to the species of *Trimeresurus*, while Catanjal believes it designates *Hemibungarus*, and de Elera believes it applies to *Dendrophis pictus*. I suspect that it should apply to the species of *Trimeresurus*.

It will thus be seen that certainly a very large portion of the deaths in the Islands from snake bites is caused by the cobra, particularly *Naja naja philippinensis*, which appears to be rather widespread in the Philippines.

Catanjal in his work adds a long annotated list of native names, and in some cases an attempt to identify them has been made. The following is a list of native names taken largely from his work. The identifications appended are my own unless otherwise stated.

\* Casto de Elera, Cat. Fauna Filipinas 1 (1895) 440, gives this name for *Hemibungarus calligaster* Wiegmann.

† Peters, Mon. Berl. Ak. (1861) 691.

## LOCAL NAMES FOR PHILIPPINE SNAKES

1. *Agnasan* (Bicol, Ambos Camarines).
2. *Aguason* (Bicol, Visayan).
3. *Aguasun* (Bicol, Visayan).

In the Bicol provinces and in certain Visayan provinces these three names are synonymous and are applied to *Boiga dendrophila* which is only a slightly poisonous snake. In Samar, Leyte, and northern Mindanao a variation of this name, *jaguason*, is sometimes applied to the cobra *Naja naja samarensis*, and possibly to other cobras.

4. *Ahas*, a general or class name for snake.
5. *Ahas-na-bitin* (Nueva Ecija), probably *Python reticulatus*.
6. *Ahas-na-cuyog* (Nueva Ecija), probably *Calamaria gervaisii*; used to be found living in groups.
7. *Ahas-na-tulog* (Nueva Ecija), sleeping snake; *culebra casera* (Spanish); names frequently applied to *Ophites aulicus*.
8. *Alibot* (Ilocano).
9. *Alimbusogan* (Bicol).
10. *Alimpayawan* (Batangas).
11. *Alimuranin*, probably a viper, *Trimeresurus*.
12. *Alindayag* (Ilocos Sur).
13. *Almoránin* (Marinduque).
14. *Alumag-in* (Cagayan and Isabela).
15. *Ambubusog* (Bicol), a name applied to *Dryophis prasinus* or other species of *Dryophis*.
16. *Amorong* (Ilocano).
17. *Anamon* (Albay); said to be a species of *Trimeresurus* which is yellowish white, probably *T. mcgregori*.
18. *Anga* (Pangasinan).
19. *Anipa*.
20. *Anipatuleng* (Ilocano), a synonym of *anipa*; said to be a black snake.
21. *Annagabang* (Cagayan).
22. *Arayat* (synonym of *ahas-na-cuyog*), *Calamaria gervaisii*.
23. *Ataybia* (Laguna).
24. *Bactan* (Surigao).
25. *Bagbag* (Palawan).
26. *Bahayon* (Surigao).
27. *Bahon* (Bohol); said to be striped yellow, red, and white.
28. *Balahilo* (Batangas); said to be yellow with yellow and black spots on the abdomen.
29. *Balanaquen* (Palawan).
30. *Balibat* (Luzon); said to be black above and yellow on the abdomen, and to have two heads.
31. *Balidbidan* (Palawan).
32. *Balilok* (Bicol and Visayan).
33. *Balitucan* (Ilocos Sur); said to have yellow spots on the body.
34. *Banacon* (Bicol and Visayan).
35. *Banahanon* (Bicol).
36. *Bannagao* (Ilocano).
37. *Banugbuyan* (Ambos Camarines).
38. *Baraisan* (Pangasinan).

39. *Bartin*.
40. *Basibas*, a synonym of *palapul*.
41. *Bayuyok* (Bohol).
42. *Beclat* (Ilocano).
43. *Bibiyain* (Laguna); said to be red above and white below. It is so named from a fresh-water eel.
44. *Biclat*, *Python reticulatus*.
45. *Bigabiga* (Pampanga).
46. *Bigsihan* (Bohol).
47. *Bilibidbilaw*.
48. *Bintwian* (Palawan).
49. *Birtin*, *Python reticulatus*.
50. *Bitin* (Pampanga, Marinduque, Panay, Negros), a name for *Python reticulatus*.
51. *Boa*, a name given by Spanish-speaking people to *Python reticulatus*.
52. *Borayoan* (Union).
53. *Boro-bunog* (Albay).
54. *Bugang-pikapik* (Batangas).
55. *Bugang-saldang* (Ambos Camarines).
56. *Bulacan* (Occidental Negros), *Dendrophis pictus*.
57. *Buoyon* (Surigao).
58. *Burayoan*.
59. *Busasawa* (Bohol).
60. *Cabangabauan* (Bohol).
61. *Cagang* (Cagayan and Isabela); probably a deadly poisonous snake.
62. *Calabucab*, a name applied in various localities to *Chersydrus granulatus*, found in both fresh and sea water. It is harmless. The name is sometimes applied to the poisonous species of *Disteira* or *Lapemis*, particularly *Disteira ornatus*.
63. *Calapain* (Bohol); said to be yellow.
64. *Calapihon* (Bicol provinces).
65. *Camamalu* (Pampango); synonymous with *tadioco* and *carasaen*; a name applied to *Naja naja* and *Naja hannah*; deadly; Casto de Elera says that it is *Hemibungarus calligaster*.
66. *Canlalamat*, synonym of *camamalu*.
67. *Carasaen* (Ilocano), a name applied to the cobras.
68. *Carasen-apimorong* (Pampango), *Naja hannah*.
69. *Cawaho*.
70. *Caypihin* (Marinduque); said to be blue.
71. *Cecilia* (Pangasinan).
72. *Cuyog* (see *ahas-na-cuyog*).
73. *Dadayaoen* (Ilocos Sur).
74. *Dahilog*; said to be a synonym of *balitoc*.
75. *Dahon-palay*, a name usually applied to *Dryophis prasinus* or to species of *Dendrophis* or *Dendrelaphis*.
76. *Dapug* (Misamis).
77. *Digmirogman* (Bohol).
78. *Dopong* or *dupong* (Bicol and Visayan); probably *Trimeresurus wagleri* or other species of *Trimeresurus*.
79. *Drira* (Ilocos Sur).
80. *Duangsungay* (Ambos Camarines).

81. *Dugjo* (Misamis); said to be a black burrowing snake, about 20 centimeters long (*Typhlops braminus*).
82. *Duhol* (Batangas); probably *Chersydrus granulatus*; harmless.
83. *Garatosan*, synonym of *ahas-na-cuyog*.
84. *Gujui* (Ilocos Sur).
85. *Hagom* (Surigao).
86. *Haguason* or *jaguason* (Misamis and Butuan); applied to *Naja naja*; deadly poisonous.
87. *Hanhan*, *Dryophis* sp.
88. *Hanlucayon*; said to be a synonym of *dahon-palay*.
89. *Ibiñgan* (Bohol); said to be black above, lighter on the sides, and yellow on the abdomen.
90. *Iliu* (Bohol); said to be very large, attaining a length of 6 meters.
91. *Inmadduquing* (Ilocos Sur).
92. *Jaguason*, see *haguason*.
93. *Kabike* (Laguna).
94. *Laob* (Bohol).
95. *Lepueng* (Pangasinan).
96. *Lilusan* (Misamis), *Boiga dendrophila*.
97. *Locaylocay* (Albay).
98. *Locoylocoy* (Bicol).
99. *Lopot* (Pangasinan).
100. *Lubag* (Bohol).
101. *Lucayon* (Visayan).
102. *Lumalabao*, a synonym of *sumasapao*.
103. *Luyen* (Ilocos Sur).
104. *Macaoalo*, a synonym of *macaualu*.
105. *Magambanay* (Surigao).
106. *Magcal* (Negros), *Python reticulatus*.
107. *Magcopo* (Bohol).
108. *Magtitina* (Misamis).
109. *Malabasan* (Tagalog); applied indiscriminately to various poisonous water snakes of the genera *Disteira* and *Lapemis*.
110. *Malabiga* (Cagayan and Isabela).
111. *Malatumbagu*; sometimes applied to the small harmless snake *Natrix spilogaster*.
112. *Malaugto* (Misamis).
113. *Mamalalaca* (Laguna).
114. *Mamayang* (Pangasinan).
115. *Mamuga* (Palawan).
116. *Manapao*, a synonym of *dahon-palay*.
117. *Mandadalag* (Bohol, Polillo, and Manila); applied to *Natrix spilogaster* about Manila and, according to Griffin, to *Trimeresurus halieus* in Polillo.
118. *Mandapug* (Misamis).
119. *Mangabang* (Pangasinan).
120. *Manghihiop* (Misamis); a name applied to the cobra, *Naja naja* and *Naja hannah*.
121. *Mangisit*, a black variety of *manapao*.
122. *Mangongugto*, a synonym of *malaugto*.
123. *Maninini* (Negros), a water snake.
124. *Manlaso* (Palawan).
125. *Mannocac* or *manucac*; said to feed on frogs.

126. *Manoc*, a synonym of *banacon*.
127. *Manoca*, *Natrix spilogaster*.
128. *Manojohoc* (Bohol).
129. *Manunugac*; applied to species of *Dryophis*.
130. *Maraubot* or *maraub-but*, said to be a synonym of *sumasapao*.
131. *Odto-odto* or *oro-odto*; names applied to various small snakes; in Negros to *Typhlops braminus*; in Palawan to *Doliophis bilineatus*.  
The first is harmless; the second is poisonous.
132. *Ongor* (Bohol).
133. *Palacang-ahas* (Tagalog), *Natrix spilogaster*.
134. *Palapal*; another two-headed snake.
135. *Palaspas*, a synonym of *dahon-palay*.
136. *Pamadduquingen* (Ilocos Sur); said to be red and black.
137. *Panas* (Ilocos Sur); said to be red and white.
138. *Pandanalion* (Surigao).
139. *Paningsingan* (Negros), *Chersydrus granulatus*.
140. *Papala* (Misamis), *Trimeresurus wagleri*.
141. *Pim-maltat*; said to be synonymous with *dahon-palay*.
142. *Pulaan* (Ilocos Sur).
143. *Quinongsing* (Pangasinan).
144. *Romuranon* (Ambos Camarines and Albay), a poisonous snake; applied to various species of *Trimeresurus*.
145. *Rupong* (Albay), probably a synonym of *dupong*; *Trimeresurus* sp.
146. *Salabay* (Bohol).
147. *Sapao*.
148. *Saua* (Visayas), applied to *Python reticulatus*.
149. *Seckaran* (Union).
150. *Sibaga* (Bohol).
151. *Silungbilao* (Pampango); this may be *Hemibungarus* sp.
152. *Sordodormillon* (Ilocos Norte); probably *Ophites aulicus*.
153. *Sua* (Surigao).
154. *Sultip* (Ilocos Norte).
155. *Sumasapao* (Ilocano), a tree snake.
156. *Tabading* (Manobo), *Natrix auriculata*.
157. *Tadioco* (Pangasinan, Pampanga); applied to the hooded cobras.
158. *Taguhilog* (Surigao).
159. *Taguig* (Palawan).
160. *Taguiualo* (Bohol).
161. *Talamuguingan* (Ilocos Norte).
162. *Talasayin* (Batangas).
163. *Talbustubu* (Marinduque), a synonym of *dahon-palay*.
164. *Talenbilao*; applied to poisonous sea serpents.
165. *Tamangulan* (Palawan).
166. *Tamguibolason* (Bohol).
167. *Tangkaybiga*, a synonym of *ulupong*.
168. *Tanquig* or *tanquip* (Surigao).
169. *Tinta*, a synonym of *tuleng* or *dueng*.
170. *Toghod* (Bohol).
171. *Tolog* (Marinduque), *Ophites aulicus*.
172. *Tuleng* (Ilocano).

- 173. *Tulog* (see *ahas-na-tulog*).
- 174. *Uao-uao* (Misamis), *Laticauda colubrina*.
- 175. *Ugalupong* (Bohol).
- 176. *Ugu* (Cagayan and Isabela).
- 177. *Uringan* (Cagayan and Isabela).
- 178. *Viracac* (Ilocos Sur).
- 179. *Walo-walo* (Negros), *Lapemis hardwickii*.

#### FAUNAL RELATIONS AND DISTRIBUTION OF PHILIPPINE SNAKES

The herpetological faunas of the Philippines, particularly the ophidian fauna, are derived from a variety of sources, but undoubtedly their greatest affinity is with Borneo. A casual glance at a map shows the Philippines joined to surrounding land bodies by a series of island chains, five or six in number.

To the north there is but a single chain comprised of the Babuyan and Batan Islands. This chain reaches nearly to Formosa, which in turn is joined with Japan through the Riu Kiu Island group. To the south and southwest there are no less than three island chains that connect with Borneo. The most important of these three is the Palawan Island group, including the Calamianes, the Cuyo Islands, Palawan, and Balabac. The second chain, not so clearly defined as the former, comprises the Cagayan Islands, and Cagayan Sulu. The third chain which approaches more nearly to the mainland is the Sulu Archipelago, which includes a number of island groups, and the larger islands Basilan, Jolo, and Tawitawi, with numerous small islands. As might be suspected the Philippines have far more genera and species in common with Borneo than with any other land body. To the south there is a second chain which divides, one branch connecting with Celebes through the Sanghir Islands, and the other with Gilolo, and the Moluccas, through Talaar, and Morotei.

There are thirty-three recognized genera of land snakes known to occur in the Philippines, and five of these are endemic. They are *Oxyrhabdium*, *Cyclocorus*, *Haplonodon*, *Typhlogeophis*, and *Hologerrhum*. The first genus has two known species; each of the other four is represented by a single species.

Two other genera found in the Philippines have not been found in Borneo. These are *Hemibungarus* and *Stegonotus*. The first of these, of which there are three known Philippine species, may have entered from the north, as the genus is represented on the mainland of Asia in India and two other species are found in the Riu Kiu Islands. Stejneger states that no species of the genus has been found in Formosa as yet, but suggests the possibility of a discovery, mentioning that little

is known of the faunas of that island. Since the very closely related genus *Callophis* is also a mainland form, the possibility is strengthened that this genus has been derived through the northern chain of islands.

The second genus, *Stegonotus*, with two species, appears to have arrived from the south by way of the southern chain of islands connecting with the Moluccas. This is certainly not an unreasonable conclusion since we find that the genus is as yet undiscovered in both Celebes and Borneo, while the Moluccas have two species, New Guinea and surrounding islands two, and the Australian mainland two.

Of the eleven families recognized in this work representatives of seven occur in the Philippines. Borneo has representatives of another family, the Anillidæ. It appears rather widespread in the Malay Archipelago, and may eventually be discovered in the Philippines. Of the subfamilies of the Natricidæ the Philippines have a representative of the Langahinæ which apparently has not been discovered in the other islands of the Malay Archipelago. Table 4 shows the general distribution of families.

TABLE 4.—Distribution of families and subfamilies of snakes.

| Family and subfamily.  | Australia. | New Guinea. | Malay Peninsula. | Borneo. | Celebes. | Moluccas. | Sulu-Mindanao. | Luzon-Visayas. | Palawan. | Formosa-Japan. | Southern Asia. | Europe. | Africa. | Madagascar. | North America. | Central America. | South America. | Pacific Islands. |
|------------------------|------------|-------------|------------------|---------|----------|-----------|----------------|----------------|----------|----------------|----------------|---------|---------|-------------|----------------|------------------|----------------|------------------|
| Typhlopidae .....      | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       | x       | x           |                | x                | x              | x                |
| Leptotyphlopidae ..... |            |             |                  |         |          |           |                |                |          |                | x              |         | x       |             | x              | x                | x              |                  |
| Boidæ:                 |            |             |                  |         |          |           |                |                |          |                |                |         |         |             |                |                  |                |                  |
| Pythoninæ .....        | x          | x           | x                | x       | x        | x         | x              | x              | x        |                | x              | x       | x       |             | x              | x                | x              |                  |
| Boinæ .....            |            | x           |                  |         |          |           |                |                |          |                | x              | x       | x       | x           | x              | x                | x              | x                |
| Anillidæ .....         |            |             | x                | x       | x        | x         |                |                |          |                | x              |         |         |             |                |                  |                |                  |
| Uropeltidae .....      |            |             |                  |         |          |           |                |                |          |                | x              |         |         |             |                |                  |                |                  |
| Xenopeltidae .....     |            |             |                  | x       | x        |           | x              |                | x        |                | x              |         |         |             | x              | x                | x              |                  |
| Natricidæ:             |            |             |                  |         |          |           |                |                |          |                |                |         |         |             |                |                  |                |                  |
| Acrochordinæ .....     |            | x           | x                | x       | x        | x         | x              | x              | x        |                | x              |         |         |             |                |                  |                |                  |
| Natricinæ .....        | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       | x       | x           | x              | x                |                | x                |
| Homalopsinæ .....      | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       |         |             | x              | x                | x              |                  |
| Coronellinæ .....      | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       |         |             |                |                  |                |                  |
| Rachiodontinæ .....    |            |             |                  |         |          |           |                |                |          |                |                |         | x       |             |                |                  |                |                  |
| Boiginae .....         | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       | x       | x           | x              | x                | x              | x                |
| Elachistodontinæ ..... |            |             |                  |         |          |           |                |                |          |                | x              |         |         |             |                |                  |                |                  |
| Langahinæ .....        |            |             |                  |         |          |           | x              | x              |          |                |                |         | x       | x           |                |                  |                |                  |
| Elapidae:              |            |             |                  |         |          |           |                |                |          |                |                |         |         |             |                |                  |                |                  |
| Hydrinæ .....          | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              |         | x       |             |                | x                | x              |                  |
| Elapinae .....         | x          | x           | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       | x       |             | x              | x                | x              |                  |
| Amblycephalidæ .....   |            |             | x                | x       | x        |           | x              |                | x        |                | x              |         |         |             |                | x                | x              |                  |
| Cobridæ .....          |            |             |                  |         |          |           |                |                |          | x              | x              | x       | x       |             |                |                  |                |                  |
| Crotalidæ .....        |            |             | x                | x       | x        | x         | x              | x              | x        | x              | x              | x       |         |             |                |                  |                |                  |



[illegible]

For the most part the genera that do occur are widely distributed in the Philippines. Thus of the thirty-three terrestrial and arboreal forms, seven have not been taken in Luzon nor, with two exceptions, in the Visayan Islands. These are *Xenopeltis*, *Dryocalamus*, *Sibynophis*, *Oligodon*, *Liopeltis*, *Typhlogeophis*, and *Haplopeltura*.

*Oligodon* has been taken in Negros, and *Liopeltis* in Samar and in Leyte. These two also occur in the Palawan group

TABLE 6.—Genera of snakes approaching, but probably not entering, the Philippines.

| Genus.                              | Malay Peninsula. | Sumatra. | Java. | Borneo. | Philippines. | Celebes. | Moluccas. | New Guinea. | Japan. | Formosa. |
|-------------------------------------|------------------|----------|-------|---------|--------------|----------|-----------|-------------|--------|----------|
| <i>Enygrus</i> .....                |                  |          |       |         |              | ×        | ×         | ×           |        |          |
| <i>Anomalocheilus</i> .....         | ×                | ×        |       |         |              |          |           |             |        |          |
| <i>Cylindrophis</i> .....           |                  | ×        | ×     | ×       |              | ×        | ×         |             |        |          |
| <i>Aerochordus</i> .....            | ×                | ×        | ×     | ×       |              |          |           | ×           |        |          |
| <i>Xenodermus</i> .....             | ×                | ×        | ×     | ×       |              |          |           |             |        |          |
| <i>Stoliczkaia</i> .....            |                  |          |       | ×       |              |          |           |             |        |          |
| <i>Anoplohydrus</i> .....           |                  | ×        |       |         |              |          |           |             |        |          |
| <i>Xenochrophis</i> .....           |                  | ×        |       |         |              |          |           |             |        |          |
| <i>Achalinus</i> .....              |                  |          |       |         |              |          |           |             | ×      |          |
| <i>Macropisthodon</i> .....         | ×                | ×        | ×     | ×       |              | ×        |           |             |        |          |
| <i>Pseudozenodon</i> .....          |                  |          | ×     |         |              |          |           |             |        |          |
| <i>Hydralabes</i> .....             |                  |          |       | ×       |              |          |           |             |        |          |
| <i>Ophisthotrophis</i> .....        |                  | ×        |       | ×       |              |          |           |             |        |          |
| <i>Brachyorrhus</i> .....           |                  |          |       |         |              |          | ×         | ×           |        |          |
| <i>Elapsoides</i> .....             |                  | ×        | ×     |         |              |          |           |             |        |          |
| <i>Lepturophis</i> .....            |                  |          |       | ×       |              |          |           |             |        |          |
| <i>Ptyas</i> .....                  | ×                | ×        | ×     | ×       |              | ×        | ×         |             |        |          |
| <i>Dinodon</i> .....                |                  |          |       |         |              |          |           |             | ×      | ×        |
| <i>Xenelaphis</i> .....             |                  | ×        | ×     | ×       |              |          |           |             |        |          |
| <i>Gonyophis</i> .....              | ×                |          |       | ×       |              |          |           |             |        |          |
| <i>Areocalamus</i> .....            |                  |          |       | ×       |              |          |           |             |        |          |
| <i>Idiopholis</i> .....             |                  |          |       | ×       |              |          |           |             |        |          |
| <i>Calamothabidium</i> .....        |                  |          |       |         |              |          | ×         |             |        |          |
| <i>Agrophis</i> .....               |                  |          |       | ×       |              | ×        |           |             |        |          |
| <i>Rhabdophidium</i> .....          |                  |          |       |         |              | ×        |           |             |        |          |
| <i>Callophis</i> .....              |                  |          |       |         |              |          |           |             | ×      |          |
| <i>Iguanagnathis</i> .....          |                  | ×        |       |         |              |          |           |             |        |          |
| <i>Bungaris</i> .....               |                  |          |       |         |              |          |           |             | ×      |          |
| <i>Enhydrus</i> .....               |                  | ×        | ×     | ×       |              | ×        |           | ×           | ×      |          |
| <i>Homalopsis</i> .....             | ×                | ×        | ×     | ×       |              |          |           |             |        |          |
| <i>Cantoria</i> .....               | ×                | ×        |       | ×       |              |          |           |             |        |          |
| <i>Emydocephalus</i> .....          |                  |          |       |         |              |          |           |             | ×      | ×        |
| <i>Enhydrina</i> <sup>a</sup> ..... | ×                |          |       |         |              |          |           | ×           |        |          |
| <i>Acalyptus</i> <sup>b</sup> ..... |                  |          |       |         |              |          |           |             |        |          |
| <i>Thalassophis</i> .....           |                  |          | ×     |         |              |          |           |             |        |          |
| <i>Amblycephalus</i> .....          | ×                | ×        | ×     | ×       |              |          |           |             |        |          |
| <i>Agkistrodon</i> .....            | ×                |          | ×     |         |              |          |           |             |        |          |

<sup>a</sup> Malay Archipelago.

<sup>b</sup> Western tropical Pacific and China Sea.

and the Mindanao-Sulu group. Of the other genera, *Dryocalamus* and *Sibynophis* are known only in the Palawan group; *Xenopeltis*, in the Palawan group and the southern Sulu island, Bongao; *Typhlogeophis* appears to be confined to Mindanao and nearby islands; *Haplopeltura* occurs both in Mindanao and in Palawan.

No table of the distribution of species is attached but the known distribution is discussed under individual species treated in this work.

A table is attached showing the distribution of extra-Philippine genera, some of which may be eventually taken in the Philippines.

#### SPECIES OF SNAKES ERRONEOUSLY ATTRIBUTED TO THE PHILIPPINE ISLANDS

*Typhlops philippinus* Cuvier, Reg. Anim. 2d ed. 2 (1829) 74; Müller, Trev. Zeits. Phys. 4: 349; Duméril and Bibron, Erp. Gén. 1: 423.

This is *Rhinophis planiceps*. It does not occur in the Philippines.

*Typhlops diardii* Schlegel.

El Archipel. Filipino 1 (1900) 675.

Does not occur in the Philippines.

*Typhlops ater* Schlegel.

El Archipel. Filipino 1 (1900) 675.

Does not occur in the Philippines.

*Python molurus* Gray.

El Archipel. Filipino 1 (1900) 673.

Erroneously recorded.

*Uropeltis philippinus* Cuvier, Reg. Anim. 2d ed. 2 (1829) 76; Duméril and Bibron, Erp. Gén. 7 (1854) 161; Marshall, Atlas. der Thier. (1887) pl. 5; Casto de Elera, Cat. Fauna Filipinas 1 (1895) 424.

*Rhinophis philippinus* Müller.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 424.

This is *Rhinophis planiceps* Peters, found only in Ceylon.

*Calamaria lumbricoidea* Boie.

Günther, part, Cat. Col. Snakes Brit. Mus. (1858) 6; Boettger, Mon. Berl. Ak. (1886); Casto de Elera, Cat. Fauna Filipinas 1 (1895) 425.

An erroneous record.

*Calamaria vermiformis* Duméril and Bibron.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 425.

Very probably an erroneous record.

*Calamaria temminckii* Duméril and Bibron.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 425.

Very probably an erroneous record.

*Aspidura brachyorrhos* Boie.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 426.

This species is confined to Ceylon.

*Oligodon sublineatus* Duméril and Bibron.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 426.

This species is confined to Ceylon and the Nicobars.

*Ablabes collaris* Gray.

It is probable that this should be *Polyodontophis bivittatus* Boulenger, as there are specimens of this species in the Santo Tomás Museum.

*Simotes russelli* Jan (= *Holarchus arnensis* Shaw).

This species is confined to India.

*Coryphodon korros* Schlegel.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 428.

This is *Ptyas korros* Schlegel. It probably does not occur in the Philippines.

*Coryphodon mucosus* Linnæus.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 428.

This is *Ptyas mucosus* and probably is confined to southeastern Asia.

*Coryphodon fuscus* Günther.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 428.

This species is *Zaocys fuscus* Günther and appears to be confined to Borneo.

*Coryphodon hexanotus* Cantor.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 428.

This is *Xenelaphis hexagonotus* Cantor and probably does not occur in the Philippines.

*Tropidonotus* aff. *dorsalis* Günther.

Müller, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 15.

*Tropidonotus* aff. *hypomelas* Günther.

Müller, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 15.

*Tropidonotus schistosus* Daudin.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 432.

This is a synonym of *Helicops schistosus* Daudin and is confined to India and Ceylon.

*Campylodon prevostianum* Duméril and Bibron, Erp. Gén. 7 (1854) 964.

This is *Gerardia prevostianum* Duméril and Bibron, and is probably confined to the Indian Ocean.

*Gonyosoma frenatum* Gray.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 432.

This is *Elaphe frenatum* Gray, and is confined to India.

*Dendrophis punctulata* Gray.

This species has been included in several lists on the strength of a record by Parenti and Picaglia, Atti. Soc. Nat. Modena Mem. Orig. 5 (1886) 50. Very probably this specimen should have been recorded as *Dendrelaphis terrificus* Peters, and the record for *D. punctulata* is undoubtedly incorrect.

*Leptophis vertebralis* Duméril and Bibron, Erp. Gén. 7 (1854) 543.

I am unable to determine the identity of this species.

*Passerita mycterizans* Linnæus.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 435.

This does not occur in the Philippines.

*Dipsas drapiezii* Boie.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 436.

This is *Boiga drapiezii* Boie, and probably does not occur in the Philippines.

*Dipsas fusca* Gray.

Casto de Elera, Cat. Fauna Filipinas 1 (1895) 436.

This is *Boiga fusca* Gray, and is confined to Australia.

*Lycodon bairdi* Steindachner (= *Psammodynastes pulverulentus*).

*Lycodon culcullatum* Duméril and Bibron, Nomencl. Rept. Amph. Mus. Zool. Berolin, Berlin (1856) 27.

This is a synonym of *Stegonotus culcullatus*, apparently confined to New Guinea and Australia.

*Lycodon modestus* part., Schlegel (= part. *Stegonotus modestus* Schlegel; part. = *Stegonotus culcullatus* Duméril and Bibron).

Neither of the two species occurs in the Philippines.

*Piesigaster boettgeri* Seane (= *Epicrates inornatus* Reinhardt).

This species was originally described from Panay through a wrongly labeled specimen. It is confined to the West Indies.

*Elaps intestinalis* Laurenti (= *Doliophis intestinalis*).

Reported by De Elera, Cat. Fauna Filipinas 1 (1895) 441.

This species probably does not enter the Philippines.

*Elaps gracilis* Gray (= *Callophis gracilis* Gray).

This species reported by De Elera, Cat. Fauna Filipinas 1 (1895) 441, appears to be confined to Malay Peninsula and near-by islands.

*Hydrophis nigrocinctus* Duméril and Bibron, Erp. Gén. 7 (1854) 1351.

This is *Disteira nigrocincta* and probably does not occur in the Philippines.

*Trimeresurus hypnale* Duméril and Bibron, Erp. Gén. 7 (1854) 1498.

This is *Agkistrodon hypnale* Merrem, confined to Ceylon and India.

#### CLASSIFICATION OF THE SNAKES

The scheme of classification followed in this work is practically identical with that used by Stejneger.\*

Suborder Serpentes.

Family Typhlopidae.

Leptotyphlopidae.

Boidae.

Subfamily Pythoninae.

Boinae.

Family Anillidae.

Uropeltidae.

Xenopeltidae.

Natricidae.

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\* Bull. U. S. Nat. Mus. 58 (1907).

Family Anillidæ—Continued.

Subfamily Acrochordinæ.

Natricinæ.

Homalopsinæ.

Coronellinæ.

Rachiodontinæ.

Boiginæ.

Elachistodontinæ.

Langahinæ.

Family Elapidæ.

Subfamily Hydrinæ.

Elapinæ.

Family Amblycephalidæ.

Cobridæ.

Crotalidæ.

In the nomenclature of the genera and species the oldest valid name is used in each case, and the variations from the nomenclature of former works must be construed as due to no other reason than necessity.

## Suborder SERPENTES Linnæus

*Serpentes* LINNÆUS, Syst. Nat. ed. 10 1 (1758) 214.

This name appears to be the oldest for this group of animals and is equivalent to the suborder Ophidia of other authors.

### *Key to the Philippine families of the Serpentes.*

- a*<sup>1</sup>. No ectopterygoid bone; teeth in upper jaw only.... Typhlopidae (p. 47).
- a*<sup>2</sup>. Ectopterygoid present; teeth in both jaws.
  - b*<sup>1</sup>. Coronoid present; supratemporal large, suspending quadrate; vestiges of hind limbs..... Boidae (p. 67).
  - b*<sup>2</sup>. Coronoid absent; no vestige of hind limb.
    - c*<sup>1</sup>. A mental groove; maxillary horizontal.
      - d*<sup>1</sup>. Prefrontal bone touching nasal..... Xenopeltidae (p. 72).
      - d*<sup>2</sup>. Prefrontal bone not touching nasal.
        - e*<sup>1</sup>. None of the anterior maxillary teeth grooved or perforated ..... Natricidae (p. 76).
        - e*<sup>2</sup>. Anterior maxillary teeth grooved or perforated.
          - Elapidae (p. 224).
      - c*<sup>2</sup>. No mental groove; maxillary horizontal.... Amblycephalidae (p. 280).
      - c*<sup>3</sup>. A mental groove; maxillary vertically erectile.... Crotalidae (p. 283).

## NONPOISONOUS SNAKES

### TYPHLOPIDÆ

*Typhlopidae*, part., JAN, Elenco Sist. Ofid. (1863) 9; GÜNTHER, Rept. Brit. India (1864) 170; COPE, Proc. Am. Philos. Soc. 23 (1886) 481; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 3.

“Cranial bones solidly united; no ectopterygoid; pterygoid not extending to quadrate or mandible; no supratemporal; præfrontal forming a suture with nasal; maxillary loosely attached, with a few teeth disposed transversely to the axis of the skull; no teeth on palate. Mandible edentulous; coronoid bone present. Vestiges of pelvis, reduced to a single bone on each side. Body covered with uniform cycloid scales; eyes under the shields.” (*Boulenger.*)

The family has three genera: *Helminthophis* with five species, confined to South and Central America; *Typhlophis* with one species, confined to South America; and the very large cosmopolitan genus *Typhlops*.

The Typhlopidae are remnants of a large cosmopolitan group of snakes, and represent probably the oldest living types. They

are for the most part diminutive in size, some species of the genus *Typhlops* never attaining a length of more than 200 millimeters. They are burrowing reptiles and are to be found about rotting logs and stumps, and burrowing in the earth or in the root masses of aërial plants.

They feed on small insects, the larvæ and eggs of insects, earthworms, scorpions, and centipedes. The eye is covered by a scale and is frequently dim or invisible in certain species; while in others the eye covering is transparent, and a distinct pupil is visible.

### Genus TYPHLOPS Oppel

*Typhlops* OPPEL, Ord. Rept. (1811) 54; GRAY, Cat. Liz. Brit. Mus. (1845) 132; JAN, Icon. Gén. (1864) 7; GÜNTHER, Rept. Brit. India (1864) 172; PETERS, Sitz. Ges. Nat. Freunde (1881) 70; BOULENGER, Fauna Brit. India, Rept. (1890) 235; Cat. Snakes Brit. Mus. 1, (1893) 7; COPE, Ann. Rept. Nat. Mus. (1898) 715; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 260.

*Typhlops*, part., SCHNEIDER, Hist. Amph. 2 (1801) 339.

*Anilius* GRAY, Cat. Liz. Brit. Mus. (1845) 135.

*Onychophis* GRAY, Cat. Liz. Brit. Mus. (1845) 32.

*Onychocephalus* DUMÉRIE and BIBRON, Erp. Gén. (1844) 272; BOETTGER, Ber. Senck. Nat. Ges. (1886) 104.

Head with enlarged regular plates; nasal shield single, double, or partially divided; prefrontal single; prefrontal, supraoculars, frontal, and parietals rather small, sometimes scarcely larger than body scales; upper labials differentiated, lower labials not or scarcely differentiated from chin scales; mouth narrow, eye usually dim; tail very short. Small burrowing snakes, non-poisonous.

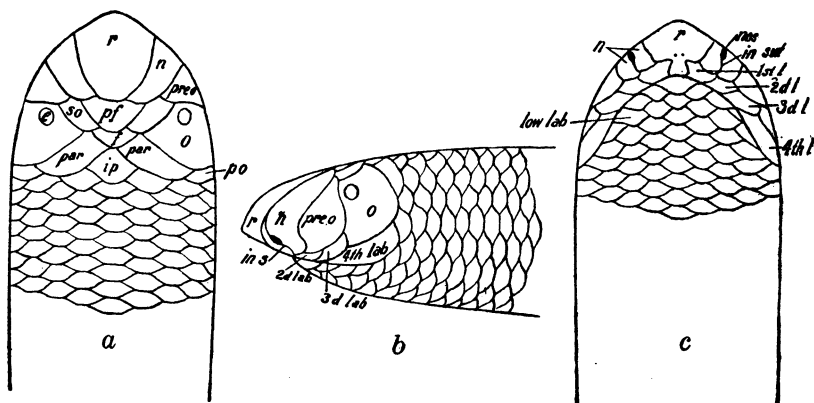


FIG. 1. Head shields of typical Typhlopidae, *Typhlops suluensis* Taylor; e, eye; f, frontal; ip, interparietal; ins, internasal suture; lab, labials; n, nasal; nos, nostril; o, ocular; par, parietal; pf, prefrontal; po, postocular; preo, preocular; r, rostral.

This genus has more than one hundred fifty known species. Representatives are found in Asia, Africa, Madagascar, Europe, Australia, East Indies, Central and South America, and the West Indies. They appear to be absent from North America and New Zealand. The East Indies have twenty known species, two of which, *Typhlops braminus* Daudin and *Typhlops olivaceus* Gray, are reported as occurring in the Philippines. The Philippines have fourteen well-defined species. They belong to two groups of the genus: one group has the snout rounded in lateral profile, the tail not longer than broad; and the other has the snout with a sharp, cutting edge, slightly hooked, and the tail at least two and one-half times as long as broad.

*Key to the Philippine species of Typhlops Oppel.*

- a<sup>1</sup>. Snout rounded; nostrils lateral; tail about as long as broad; no subocular.
  - b<sup>1</sup>. Preocular in contact with second and third labials.
    - c<sup>1</sup>. Nasal cleft arising from preocular; nasal completely divided; scales in 20 rows..... *T. braminus* (Daudin) (p. 50).
    - c<sup>2</sup>. Nasal cleft arising from second labial; nasal completely divided; scales in 26 rows..... *T. luzonensis* Taylor (p. 52).
  - b<sup>2</sup>. Preocular in contact with third labial only; nasal not completely divided.
    - c<sup>1</sup>. Scales in 28 rows; nasals in contact behind rostral; deep black above, yellowish below..... *T. jagorii* Peters (p. 53).
    - c<sup>2</sup>. Scales in 30 rows; nasals not in contact behind rostral; reddish brown above, yellowish below..... *T. ruficauda* (Gray) (p. 54).
    - c<sup>3</sup>. Scales in 26 rows; nasals not in contact behind rostral; reddish brown above, lighter below..... *T. ruber* Boettger (p. 55).
    - c<sup>4</sup>. Scales in 30 rows; nasals not in contact behind rostral; black above, yellowish below..... *T. canlaonensis* Taylor (p. 55).
- a<sup>2</sup>. Snout rounded; nostrils lateral; tail as long as broad; a subocular present; nasal cleft arising from second labial; nasal not completely divided; scale rows 28; nasals not in contact behind rostral..... *T. manilæ* Taylor (p. 56).
- a<sup>3</sup>. Snout with a sharp horizontal edge; nostrils lateroinferior; tail at least twice as long as broad; no subocular.
  - b<sup>1</sup>. Preocular in contact with second and third labials; nasals not in contact behind rostral.
    - c<sup>1</sup>. Nasal cleft arising from first labial.
      - d<sup>1</sup>. Nasal not completely divided.
        - e<sup>1</sup>. Tail two and one-half times as long as broad; scales in 20 to 22 rows..... *T. olivaceus* (Gray) (p. 58).
        - e<sup>2</sup>. Tail three and one-half times as long as broad; scales in 26 rows..... *T. rugosa* Taylor (p. 58).
      - d<sup>2</sup>. Nasal completely divided.
        - e<sup>1</sup>. Tail three times as long as broad; scales in 26 to 28 rows..... *T. dendrophis* sp. nov. (p. 60).

- e<sup>2</sup>. Tail two and two-fifths times as long as broad; scales in 22 rows..... *T. suluensis* Taylor (p. 61).
- c<sup>2</sup>. Nasal cleft arising from first or second labials or their interlabial suture; nasal completely divided; tail six to seven times as long as broad; scales in 26 rows..... *T. longicauda* Taylor (p. 63).
- b<sup>2</sup>. Preocular in contact with a single labial.
- c<sup>1</sup>. Nasal cleft arising from first interlabial suture; nasal not completely divided; tail three and four-fifths times as long as broad; scales in 26 rows..... *T. mindanensis* sp. nov. (p. 65).
- c<sup>2</sup>. Nasal cleft arising from first labial; nasal completely divided; tail four or five times as long as broad; scales in 24 rows..... *T. cumingii* (Gray) (p. 66).

#### TYPHLOPS BRAMINUS (Daudin)

*Eryx braminus* DAUDIN, Hist. Nat. Rept. 7 (1803) 279.

*Tortrix russelii* MERREM, Tent. Syst. Amph. (1820) 84.

*Typhlops braminus* CUVIER, Règne Anim. ed. 2 (1829) 73; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 16; Fauna Brit. India, Rept. (1890) 236; BOETTGER, Ber. Senck. Nat. Ges. (1886) 104; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 254; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 423; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 260; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 354.

*Argyrophis bramicus* GRAY, Cat. Liz. Brit. Mus. (1845) 138.

*Argyrophis truncatus* GRAY, Cat. Liz. Brit. Mus. (1845) 138.

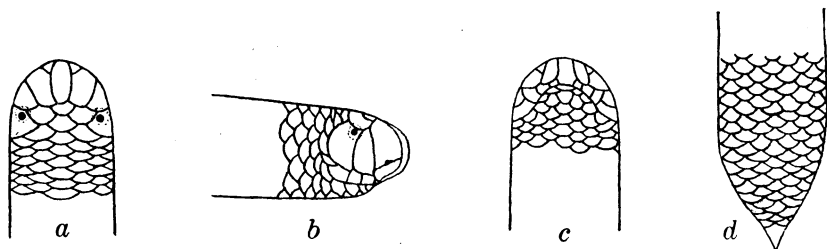


FIG. 2. *Typhlops braminus* (Daudin); after Stejneger; a, head, dorsal view; b, head, lateral view; c, head, ventral view; d, anal region and tail.

*Description of species.*—(From No. 276, E. H. Taylor collection; collected at La Granja, La Carlota, Occidental Negros, July, 1916, by H. C. McNamara.) Snout rounded in lateral profile, projecting; rostral narrow, its upper portion about one-third width of head, not extending quite to level of eyes; prefrontal not enlarged, very much rounded behind, separating the nasals by a small distance, scarcely as large as frontal, but of similar shape; frontal a little larger than interparietal, which is followed by a very much larger scale; supraoculars not angular, larger than frontal, their lower edge passing near middle of eye; parietals slightly enlarged, larger than supraoculars, followed by a large postparietal; 2 nasals, anterior (or inferior) much smaller than posterior; suture dividing nasals arises from

preocular; latter somewhat smaller than ocular, touching second and third labials, and inferior nasal below; ocular large, with eye usually visible beneath it, with a single postocular behind; 4 labials, the fourth largest, all abruptly increasing in size from the first; 5 to 7 scales on lower jaw between angles of mouth; scales in 20 rows around body; body width in body length, 34; tail a little shorter than wide.

*Color in life.*—Pearl gray above, each scale showing an area of brownish gray and one of bluish gray; below the same; without close scrutiny it appears a uniform pearl gray.

*Measurements of Typhlops braminus (Daudin).*

|                            | mm.  |
|----------------------------|------|
| Total length               | 154  |
| Tail                       | 2.75 |
| Width of head between eyes | 3.25 |
| Body width                 | 4.5  |
| Tail width                 | 4    |

*Variation.*—Practically no variation in scalation is observable. In color the specimens vary from black-brown to gray-blue or pearl gray. Some seem to turn whitish before they shed their skin, yet certain newly shed specimens also are of a very light color; in the one described the eye is almost entirely concealed, and the scales on the head and body seem thicker than usual. There are certain lighter tracings which invariably appear under the scales of the head. The fringed markings which follow the rostral and nasal sutures are characteristic of this species; these markings can usually be discerned even in gray specimens, if a small lens is used.

One specimen in my collection (No. 277) has a very different appearance from the one described. The head as far as the eyes is a pure cream color; the eyes are visible as minute black dots; the head seems more rounding in upper profile and is thicker than in other specimens. The color on the neck is light brown, gradually merging into the slightly darker brown color of the body. Each scale has a brown spot and a lighter area. No variation from the typical scalation of *Typhlops braminus* can be discerned. This variation is unique in a lot of more than 200 specimens examined.

*Remarks.*—This is one of the commonest snakes in the Philippine Islands, but it is not evenly distributed. Mr. H. C. McNamara collected more than a hundred at La Granja, La Carlota, Occidental Negros, in a few weeks; at various other localities in Negros I have been unable to find a single specimen, even

after considerable search. I did not find a single specimen in eastern Mindanao in two years' collecting. In Mindoro, near Calapan, I found this species in large numbers under rocks after heavy rains. The place failed to yield a single specimen when visited at a later time when the earth was dry. These snakes lay comparatively large, elongate eggs. They feed largely on the larvæ and eggs of small insects or earthworms.

The species is known from many localities in Luzon, and from Negros, Samar, Mindanao, Mindoro, Palawan, and Busuanga. It is probably found in all the larger islands of the Philippines. Outside of the Philippines it is widely distributed, from South Africa to southern Asia, and throughout the islands of the Indian Ocean and the Malay Archipelago. It is present also in Japan, Madagascar, and Guam.

#### TYPHLOPS LUZONENSIS Taylor

*Typhlops luzonensis* TAYLOR, Philip. Journ. Sci. 14 (1919) 105.

*Description of species.*—(From the type, No. 109, E. H. Taylor collection; collected on Mount Maquiling, Laguna, Luzon, May 12, 1915, by E. H. Taylor.) Head rather flat, broader than neck, lower jaw not or scarcely visible in lateral profile; snout rounded, projecting, rather truncate, its end only slightly less deep than head on a level with eyes; portion of rostral visible above much longer and a little wider than the part below, failing to reach the level of eyes by a minute distance, and minutely less than half the width of head; prefrontal larger than frontal, forming a suture with rostral a little less than one-third its own width, its longest sutures formed with supraoculars; frontal, the smallest head scale, forming equal sutures with interparietal and prefrontal; supraocular about same size as parietal, its lower point barely reaching eye; parietals somewhat narrowed on their lower end; nasal completely divided; nasal suture arises from second labial and after passing nostril reaches rostral in a line horizontal to upper edge of nostril; nasals not in contact behind rostral; preocular reaching above level of eyes, about as broad as ocular, in contact with 2 labials below; its edge crosses over middle of eye; 2 postoculars only slightly differentiated from body scales; first labial very small, in contact with anterior nasal only; second labial nearly three times as large as first, touching both nasals and preocular; third labial more than twice as large as second, and a little larger than fourth; lower jaw narrow, about 5 scales on lower jaw between fourth upper labials; eye a visible black spot, very small, with no pupil evident; about 338 scales from head to vent; 10 subcaudal scales;

tail ending in a small spine; width of body in total length, 58; tail as wide as long; scales in 20 rows.

*Color in life.*—Above, a reddish olive brown; below, yellowish brown, each scale with a darker yellowish brown area, giving a checked appearance on close examination; rostral, nasal, and labials on underside of snout yellowish white.

*Measurements of Typhlops luzonensis Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 260 |
| Tail          | 4   |
| Width of body | 4.5 |
| Width of head | 4.5 |
| Width of tail | 4   |

*Remarks.*—Only the type specimen is known. The species is obviously related to the group of the genus represented by *Typhlops ruficauda*, *T. ruber*, and *T. kraalii*, the first two of which are represented in the Philippine fauna. From *T. ruficauda* it differs in having 4 less rows of scales about the body and the nasal completely, instead of partially, divided. From *T. ruber* it differs in having the preocular in contact with 2 labials instead of 1, the nasal completely divided, and the length greater in proportion to the width of the body. (Here the width of the body is contained in the total length 58 times, while in *T. ruber* it is only 36.) From *T. kraalii* it differs in having the rostral much more than one-third the width of the head, and the preocular in contact with 2 labials instead of 1; in color it is also somewhat different from *T. kraalii*, and the latter is very probably a larger species.

The type was collected low on the side of Mount Maquiling, Laguna, Luzon. It was discovered under a rotting log. Nothing further is known of its habits.

**TYPHLOPS JAGORII Peters**

*Typhlops jagorii* PETERS, Mon. Berl. Ak. (1861) 684; BOETTGER, Ber. Senck. Nat. Ges. (1886) 104; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 18; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 423; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 254.

*Description of species.*—(After the type description.) Snout depressed, rounded; nostrils lateral; upper portion of rostral elliptic, about half as broad as head; nasals in contact behind rostral; preocular present, in contact with third labial only; prefrontal larger than frontal; supraoculars smaller than parietal; 4 upper labials, second twice as large as first; 28 rows of scales around the body.

*Color.*—Above dark black, the underside, lips, and end of tail yellow.

*Measurements of Typhlops jagorii Peters.*

|              | mm. |
|--------------|-----|
| Total length | 220 |
| Head length  | 8   |
| Tail         | 5   |

*Remarks.*—The type was collected by F. Jagor on Mount Isarog, Camarines, Luzon. It is well differentiated from the other Philippine species by the junction of the nasal shields behind the rostral. It is known only from the type.

## TYPHLOPS RUFICAUDA (Gray)

*Anilios ruficauda* GRAY, Cat. Liz. Brit. Mus. (1845) 136.

*Typhlops (Anilios) ruficauda* PETERS, Mon. Berl. Ak. (1861) 684.

*Typhlops ruficauda* BOETTGER, Ber. Senck. Nat. Ges. (1886) 104; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 29; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 423; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Typhlops dichromatus* JAN, Icon. Gén. (1864) 21, l. 3, pls. 4, 5, fig. 1.

?*Typhlops petersii* STEINDACHNER, Verh. Zool.-Bot. Ges. Wien (1867) 515, pl. 13, figs. 7-9.

*Description of species.*—(From Boulenger.) "Snout rounded, moderately projecting; nostrils lateral. Rostral about one third the width of the head, extending to the level of the eyes; nasal semidivided, the cleft proceeding from the second labial; præocular present, as broad as the ocular, in contact with the third labial only; eyes distinct; præfrontal, supraocular, and parietal considerably larger than the scales on the body; four upper labials. Diameter of body 31 to 55 times in the total length; tail as long as broad, ending in a spine. 30 scales round the body."

*Color.*—"Reddish brown above; snout, tail, and lower surfaces yellowish.

"Total length 250 millim."

*Remarks.*—The types (one adult, one half-grown, and one young) are in the British Museum. The exact locality from which the types were obtained is no longer known. Peters\* reports specimens from Daraga and Paracale, in southern Luzon. Boulenger† has referred *Typhlops petersii* Steindachner to this species, with a question mark. At the present time I am unable to offer an opinion and propose leaving it a synonym of *T. ruficauda*. I have not seen Steindachner's description or figures. Known only from the Philippines. The types were probably collected by H. Cuming.

\* Mon. Berl. Ak. (1861) 684.

† Cat. Snakes Brit. Mus. 1 (1893) 29.

## TYPHLOPS RUBER Boettger

*Typhlops ruber* BOETTGER, Zool. Anz. 20 (1897) 164; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Description of species.*—(After the type description.) Head depressed, snout rounded and strongly projecting; nostrils lateral; rostral moderately broad, upper part somewhat more than one-third the width of head, its posterior part not reaching level of eyes, its underside clearly longer than broad; nasal almost entirely divided, the suture arising from second labial; preocular as broad as ocular, in contact below with only the very large third labial; eye small, very distinct; upper head shields, with the exception of the middle longitudinal row, considerably larger than body scales; 4 upper labials, of which the last 2 are especially well developed and of nearly the same size; diameter of body in total length, 36 to 37; tail somewhat broader than long, ending in a sharp spine; 26 scale rows about body.

*Color.*—Uniform, bright red-brown above; below scarcely as bright as above.

Total length, 225 millimeters.

*Remarks.*—I have been unable to find specimens of this species. Obviously it is very rare and, I believe, still known only from the type, which came from Samar. This species is said to be closely related to *Typhlops kraalii* from the Kei Islands near New Guinea, but differs in being less slender, and in having the tail shorter, the scales on the head larger, and the color different.

## TYPHLOPS CANLAONENSIS Taylor

*Typhlops canlaonensis* TAYLOR, Philip. Journ. Sci. § D 11 (1917) 354.

*Description of species.*—(From No. 241, E. H. Taylor collection; collected at an elevation of about 750 meters on Canlaon Volcano, Negros, December 25, 1915, by E. H. Taylor.) Head depressed, a little wider than body; snout projecting moderately; rostral elliptic, distinctly wider behind than at tip of snout and failing to reach level of eyes by half the width of prefrontal, more than one-third the width of head; nostrils lateral, not visible from above; nasals large, not in contact behind rostral, not completely divided by nasal cleft, which arises from second labial and passes through nostril to a point about halfway from nostril to rostral; nasal in contact with first 3 labials; preocular present, narrowed to a point at its upper end, its greatest width, equal to that of ocular, occurs below level of eye; preocular narrowly in contact with supraocular above and

with only the third labial below practically the same length as ocular; ocular somewhat rectangular in outline, rapidly narrowed to a point above and below, in contact with third and fourth labials, bordered posteriorly by 2 somewhat enlarged body scales (3 on left side); prefrontal wider than deep, distinctly larger than frontal, which is somewhat wider than long, and narrowly in contact with prefrontal; supraoculars larger than either of these scales and about equal in size to parietals, which are a little more elongate and more than half lying behind oculars; interparietal scale not as large as frontal; eye visible near anterior border of ocular, much below the point of contact with supraocular; eye rather large, pupil distinct and whitish; 30 scale rows about body; tail ending in a sharp spine.

*Color in life.*—Above shiny greenish black (appearing dark green in certain lights); snout dark brown; underside of snout, belly, and entire tail pinkish yellow. The dark and the yellow areas are well defined, the black covering 15 scale rows. Head with narrow lighter lines, more or less outlining the head scales.

*Measurements of the type of Typhlops canlaonensis Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 122 |
| Tail          | 2.5 |
| Width of head | 4.2 |
| Width of body | 3.5 |
| Width of tail | 3   |

*Remarks.*—This species is related to *Typhlops ruficauda* Gray. It differs much in color, the rostral is wider and does not reach the level of the eye, and the tail is wider than long. In coloring it resembles *T. jagorii* Peters, from Luzon, but the nasals are not completely divided and do not touch behind the rostral; the second labial is far from twice as large as the first. It is impossible to tell whether the specimen at hand is adult or not. However, it is probable that it is a smaller form than the other two species mentioned above. Only one specimen was found, although the locality was very thoroughly searched. It was found burrowing under a decayed log.

**TYPHLOPS MANILÆ Taylor**

*Typhlops manilæ* TAYLOR, Philip. Journ. Sci. 14 (1919) 106.

*Description of species.*—(From the type, an unnumbered specimen in Santo Tomás Museum, labeled "Filipinas;" locality and collector unknown; probably from Luzon.) Snout rounded in front, projecting about 2 millimeters; a distinct depression across head in region of eyes; rostral narrowed at a point on snout

between nostrils, distinctly longer than wide below; rostral little more than one-third the width of head; nasals not in contact behind rostral; rostral reaching level of eyes; prefrontal rather large, narrowly in contact with frontal; supraoculars large, their lower end not reaching eye; frontal slightly smaller than prefrontal, about the same shape; parietals rounding, a little broader than deep, smaller than supraocular; interparietal enlarged; nasal not completely divided; suture issues from second labial, then makes a backward deflection which widens the anterior part of nasal; preocular narrowed at upper end, reaching above level of eye but scarcely reaching below level of nostril, abruptly widened below eye, its posterior suture with ocular not crossing eye; nasal much wider than either preocular or ocular; a small subocular scale below ocular in contact with second and third labials; preocular touches second labial behind this intercalated scale; ocular widens abruptly on a level with eye, and extends higher than preocular; first labial elongate, second higher and shorter, of nearly the same area, third very large, three or four times as large as second, reaching to near the top level of nostril, larger and higher than fourth labial (third labial on one side is fused with subocular); 3 scales border ocular behind; eyes very small but distinct; nostril comparatively large; lower jaw very narrow, in its middle scarcely two-fifths the width of head. Tail ends in a blunt spine; 12 scales under tail in a longitudinal line; scales in 28 rows about body.

*Color in life.*—Reddish brown above, the anterior part rather more grayish brown; the posterior two-thirds of body darker brown; head distinctly marked with darker and lighter (usually) curved areas; snout yellowish; below light yellowish, each scale with a slightly darker area.

*Measurements of Typhlops manilæ Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 280 |
| Tail          | 5   |
| Width of tail | 5.2 |
| Width of body | 5   |
| Width of head | 5.5 |

*Remarks.*—This unique specimen was found in the collection of the Santo Tomás University, Manila. The container was labeled "Filipinas" with no indication as to the locality from which it came. This species as characterized by the presence of a subocular has no close affinity among other species of the genus in the Philippines. It belongs to the division of the genus of which *Typhlops ater* and *T. inornatus* are members, but differs

from them in the very much larger number of scale rows, as well as in other characters.

#### TYPHLOPS OLIVACEUS (Gray)

*Onychophis olivaceus* GRAY, Cat. Liz. Brit. Mus. (1845) 133.

*Onychocephalus olivaceus* PETERS, Mon. Berl. Ak. (1861) 684;  
BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; CASTO DE ELERA, Cat.  
Fauna Filipinas 1 (1895) 424.

*Typhlops olivaceus* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 50;  
GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Description of species.*—(From Boulenger.) "Snout very prominent, with a narrow, sharp, subcrescentic transverse edge and inferior nostrils. Rostral large, its upper part longer than broad and about three-fifths the width of the head, not extending to the level of the eyes, its lower part as broad as long; nasal nearly completely divided, the cleft proceeding from the first labial; præocular present, nearly as broad as the nasal or the ocular, in contact with the second and third labials; eyes distinct; præfrontal considerably enlarged; four upper labials. Diameter of body 50 to 68 times in the total length; tail twice and a half as long as broad, ending in a spine; 20 or 22 scales round the body. Pale brown, lighter inferiorly.

"Total length 410 millim.

"Philippines, Moluccas, North-west Australia."

*Remarks.*—Boulenger \* records four specimens. One specimen, the type, is from the Philippines. Peters † gives two localities on Samar, Loquilocun and Borongan. Here, he states, it is called *tuna*. The types were collected by H. Cuming. I have been unable to find this species, and there is no specimen in the Bureau of Science collection. Boulenger gives *Typhlops (Onychocephalus) angusticeps* Peters as a synonym of this species. An examination of Peters's figures ‡ leads me to regard this as an error. The presence of a subocular, as well as of other characters, would seem to prohibit this association.

#### TYPHLOPS RUGOSA Taylor

*Typhlops rugosa* TAYLOR, Philip. Journ. Sci. 14 (1919) 109.

*Description of species.*—(From the type, No. 97, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, July 14, 1913, by E. H. Taylor.) Head rough, the anterior outline

\* Boulenger, Cat. Snakes Brit. Mus. 1 (1893) 51.

† Peters, Mon. Berl. Ak. (1861) 684.

‡ Mon. Berl. Ak. (1877) 417, pl. figs. 3, 3a, 3b, 3c.

broken by depressions between scales along sutures, with transverse cutting edge, somewhat hooked in lateral profile; rostral a little longer than wide above, not reaching level of eyes, more than one-third the width of head; part of rostral below as deep as wide, dimly granular; prefrontal a little wider and somewhat smaller than frontal, its posterior point reaching a little beyond level of eyes; frontal as broad as long, larger than interparietal; supraocular larger than frontal, wider than deep; parietals much larger than frontal, separated by an interparietal, which is smaller than frontal; parietals not twice as wide as long; nasal with a swollen prominence about and above nostril, which gives the anterior head outline an irregular appearance; nostrils latero-inferior, not visible from above; nasal cleft issues from first labial and barely passes beyond nostril, not wholly dividing the scale; preocular not as wide as and much shorter than nasal, in contact with 2 labials; eyes dim, barely outlined; 2 postoculars, inferior largest, in contact with fourth labial; 4 upper labials, fourth largest, first and second smallest, subequal in size; scales in 26 rows; tail ending in a sharp spine; 479 scales in a longitudinal row from head to tail; body width in total length, 50; tail width in tail length, 3.5; tail length in body length, about 17.

*Color in life.*—Above brownish to golden yellow, slightly lighter beneath. There is very little distinction between the two colors, as they merge gradually on the sides. Each scale with a somewhat darker area.

*Measurements of Typhlops rugosa Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 395 |
| Tail          | 23  |
| Width of head | 7.5 |
| Width of body | 8   |
| Width of tail | 6.5 |

*Remarks.*—Two other specimens besides the type were taken, one adult, and one young. These two were forwarded to Dr. Lawrence E. Griffin, at the University of Pittsburg. They have not been at hand for comparison. All were taken in masses of fern roots growing in high forest trees. *Typhlops rugosa* has no close affinity among the Philippine species, unless it be with *T. mindanensis* Taylor. From the latter it differs in the size of the frontal, which is larger than the prefrontal in *T. mindanensis*. The former has 2, the latter 3, labials touching the nasal; in the former the head is very rough, in the latter, comparatively smooth. Many other differences are obvious on a

comparison of the two descriptions. The roughness of the head in *T. rugosa* is not unlike that in *T. crossii* and *T. reginæ* but here the resemblance between them ceases.

**TYPHLOPS DENDROPHIS** sp. nov.

*Type*.—No. 93, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August 15, 1913, by E. H. Taylor.

*Description of type*.—Head flattened above, elliptic in outline, broader than neck; snout in lateral profile rather wedge-shaped, with a narrow, sharp, subcrenate, transverse edge, with nostrils inferior; rostral about as broad below as above, a little more than one-third width of head, reaching level of eyes; prefrontal angular, forming a suture with rostral about one-third its width, a little larger than frontal but of the same shape, much wider than deep; frontal wider than deep, forming equal sutures with prefrontal and interparietal; latter a little wider than frontal and followed by 2 or 3 enlarged scales (the latter character is not constant); supraocular wider than deep, its lower point failing to reach eye; parietals much elongate, twice as long as wide, reaching to near level of eye; nostril between 2 nasals, anterior very small and narrow, the suture dividing them arising from first labial; edge of rostral approaches close to nostril; preocular present, not as wide or as deep as ocular, not touching eye, in contact with 2 labials below; 3 scales behind ocular; latter large, with a slight rounded prominence above eye; first labial as large as or larger than second, fourth larger than third; tail ending in a sharp spine; 26 rows of scales about body, 497 in a longitudinal row from back of head to end of tail, 29 scales under tail from anus to tip. Body width in body length, 49.7; tail width in tail length, 3.1.

*Color in life*.—Above olive to brownish yellow, grading insensibly into the lighter color on belly. Each scale with a lighter and darker part; snout somewhat lighter.

*Measurements of Typhlops dendrophis* sp. nov.

|               | mm.  |
|---------------|------|
| Total length  | 398  |
| Tail          | 21   |
| Width of body | 8    |
| Width of tail | 6.75 |

*Variation*.—There are three specimens of this species in my collection, and one mutilated specimen in the Bureau of Science collection, all collected at Bunawan, Agusan, Mindanao. They agree fairly well in measurements and proportions. The body

width in the body length varies from 46 to 49; tail width in tail length, 3.1. All the specimens save the type have 28 scale rows around the body. The relation of the nasal cleft and the preocular to the labials is identical in all the specimens; they are also identical in color.

TABLE 7.—Measurements and scale counts of *Typhlops dendrophis* sp. nov.

| No.  | Length. | Tail. | Scale rows. | Width of body. | Width of tail. | Body width in total length. | Tail width in tail length. | Scales under tail. | Collection.        |
|------|---------|-------|-------------|----------------|----------------|-----------------------------|----------------------------|--------------------|--------------------|
|      | mm.     | mm.   |             | mm.            | mm.            |                             |                            |                    |                    |
| 93   | 398     | 21    | 26          | 8              | 6.75           | 49.7                        | 3.11                       | 29                 | E. H. Taylor.      |
| 94   | 334     | 17    | 28          | 7.25           | 5.50           | 46.0                        | 3.09                       | 28                 | Do.                |
| 95   | 392     | 20    | 28          | 8              | 6.50           | 49                          | 3.07                       | 28                 | Do.                |
| 1745 | -----   | ----- | 28          | 6              | 4.75           | -----                       | -----                      | 29                 | Bureau of Science. |

*Remarks.*—This species is related to *Typhlops olivaceus* (Gray), but differs in having the rostral reach the level of the eye, and the nasal completely divided. The diameter of the body is forty-six to forty-nine times in its total length. The tail is more than three times as long as wide, with 4 to 6 more rows of scales around the body than in *T. olivaceus*. From *T. cumingii* it differs in having the preocular in contact with 2 labials instead of 1, the tail much shorter, the rostral reaching the level of the eyes, and in having more rows of scales about the body. It is a larger, less-slender species than *T. cumingii*. All four specimens were taken from the root masses of the aërial fern *Asplenium nidus*, obtained when the high forest trees were felled. The snakes burrow in the tough root masses and feed on the larvæ of ants and centipedes which are abundant in the fern roots.

#### TYPHLOPS SULUENSIS Taylor

*Typhlops suluensis* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 257.

*Description of species.*—(From the type, No. 2001, Bureau of Science collection; collected on Bubuan Island, Tapan group, Sulu Archipelago, October 2, 1917, by E. H. Taylor.) Snout rather pointed, with a moderately sharp edge; rostral nearly half the width of head, rather truncate behind, forming a broad, straight suture with prefrontal; latter very large, broadly triangular in shape, its longest sutures with preoculars; frontal very small, bordered by 6 scales, about one-fifth the size of prefrontal; interparietal as wide as prefrontal, but somewhat smaller; supra-

oculars slender, about two and a half times as long as broad; parietals much larger than supraoculars, little more than twice as long as wide; nasals separated, their upper ends barely extending beyond the posterior level of rostral, which reaches almost to the anterior level of eyes; nasal completely divided by nasal cleft, which arises from first labial; preocular in contact with 2 labials, not as wide as ocular, its upper end scarcely reaching higher than the upper level of eye; eye distinct, with a minute pupil visible, not crossed by suture of ocular with preocular; 2 body scales border ocular behind; 4 lower labials, second scarcely larger than first; scales in 22 rows around middle of body, 20 on neck, 22 in front of anus, tail ending in a sharp

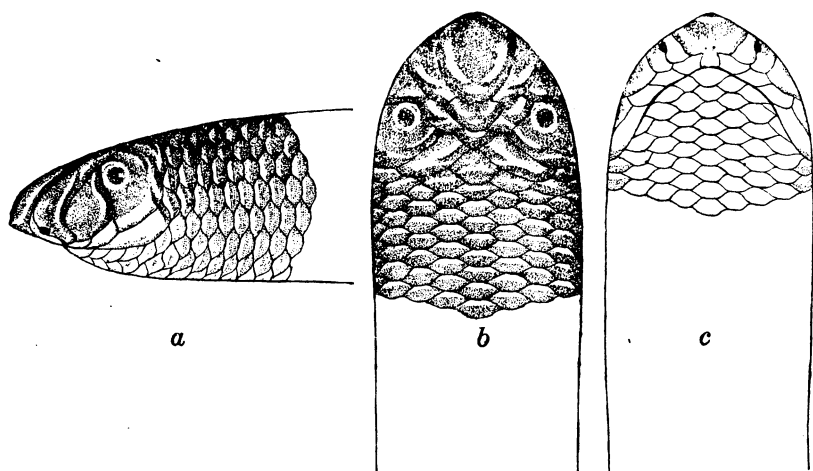


FIG. 3. *Typhlops suluensis* Taylor; from the type; a, head, lateral view; b, head, dorsal view; c, chin;  $\times 3$ .

spine; body width in body length, 46; tail width in tail length, 2.5; tail length in body length, 26.

*Color in life.*—Above dark drab-gray, covering nine whole and two half rows of scales, each scale with a slightly curved lighter area, which forms a fine-meshed network over body; balance of body very light gray, the ventral median row of scales differentiated by being much lighter in color, with the outer edges and the edges of adjacent scale rows slightly darker; occasionally an entire scale is white in the median ventral row; tip of tail and anal region whitish; underside of head rather light dirty white; head with lighter curved lines, arranged regularly but not following the outlines of the head scales.

*Measurements of Typhlops suluensis Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 340 |
| Tail          | 13  |
| Width of tail | 5.5 |
| Width of body | 7.4 |
| Width of head | 5.5 |

*Remarks.*—The type was found in a rotten log only about 4 meters from high-tide mark on the beach. Much effort was made to obtain other specimens on Bubuan Island, but none was found. This species seems to be most closely related to *Typhlops multilineatus* and *T. olivaceus*. From *T. multilineatus* it differs in having the rostral shorter, the nasal completely divided, the diameter of the body contained in the total length forty times (in *T. multilineatus* fifty to sixty times), and 22 instead of 20 scale rows around the middle of the body. The prefrontal is larger, the frontal smaller, and the markings are not arranged in longitudinal lines. From *T. olivaceus* it differs in having a complete division of the nasal, the preocular much narrower than the ocular, and the rostral barely half the width of the head. The color is also different from *T. olivaceus*.

## TYPHLOPS LONGICAUDA Taylor

## PLATE 1

*Typhlops longicauda* TAYLOR, Philip. Journ. Sci. 14 (1919) 108.

*Description of species.*—(From the type, No. R 99, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, July 15, 1913, by E. H. Taylor.) Head rather broader than neck, rather rounding in outline; snout with a sharp horizontal cutting edge, moderately projecting, not or but scarcely hooked in profile; rostral not as wide below as above, somewhat narrowed between nostrils, failing to reach level of eye by more than half the depth of prefrontal; latter wider than deep, larger than frontal, the suture formed with it larger than that with rostral which is only about one-fifth its width; frontal about as wide as deep, equal to parietals; parietals each divided into 2 scales, which are about the size of the body scales and scarcely differentiated from them, the second one, lying somewhat behind ocular, largest; interparietal somewhat larger than frontal; supraocular diagonal, the lower point reaching anterior level of eye but failing to reach horizontal level by its distance from nasal; 2 nasals, the anterior very small; the suture dividing them arises from

first interlabial suture; preocular narrower and much shorter than ocular, in contact with 2 labials below; ocular large, with a slight, rounded prominence over eye; eye and pupil distinct; 4 postoculars between parietal and fourth labial; 4 labials, first and second smallest, subequal in size, third more than twice as large as second and about half the size of fourth; scales in 26 rows; about 430 scales in a longitudinal line to above vent; 40 scales in a row on underside of tail; body width in body length, 56.6; tail width in tail length, 7.2.

*Color in life*.—Above light yellowish brown, gradually becoming lighter below; head lighter with curving lighter marks; laterally there is a distinct, more or less rectangular, lighter spot, including eye and reaching mouth. Each ventral scale has a larger darker brown area.

*Measurements of Typhlops longicauda Taylor.*

|               | mm.  |
|---------------|------|
| Total length  | 340  |
| Tail          | 34.5 |
| Width of head | 5.5  |
| Width of body | 6    |
| Width of tail | 4.75 |

*Variation*.—Ten other specimens of this species are in my collection; all differ from the type in having a single parietal. This character in the type may be anomalous. The origin of the nasal suture is not fixed, usually arising near the first interlabial suture, sometimes from first labial, sometimes from second. The body width in the body length varies from 45 to 68, the average being about 52; the tail is from six to seven times longer than broad, the average being about 6.2. They vary in shade from yellowish to golden brown above, somewhat lighter below.

*Remarks*.—This species has a very marked, apparently normal enlargement of the pelvic bones, and the tail is comparatively longer than in any other of the extremely numerous species of this genus. The specimens were obtained for the most part from root masses of the large aërial fern *Asplenium nidus*. They were common at Bunawan, Agusan. Two were taken from the trunks of small trees which were tunneled by large black ants. The species feeds on the larvæ of ants and centipedes. It is known only from the type locality. It appears to be related to *Typhlops cumingii* Gray but differs from it in having a longer tail, in the larger number of scale rows, and in having the preocular in contact with 2 labials instead of 1.

TABLE 8.—Measurements and scale counts of *Typhlops longicauda* Taylor.

| No.      | Length. | Tail. | Body width. | Tail width. | Body width in length. | Tail width in tail length. |
|----------|---------|-------|-------------|-------------|-----------------------|----------------------------|
|          | mm.     | mm.   | mm.         | mm.         |                       |                            |
| 100..... | 348     | 31    | 6           | 4.9         | 58                    | 6.1                        |
| 101..... | (a)     | 26    | 5.5         | 4.25        |                       | 6.1                        |
| 108..... | 180     | 16    | 4           | 2.7         | 45                    | 6                          |
| 102..... | 314     | 27.5  | 6           | 4.5         | 52                    | 6.1                        |
| 103..... | (b)     | 31    |             | 5           |                       | 6.2                        |
| 104..... | 286     | 23    | 5           | 3.7         | 57                    | 6.2                        |
| 105..... | 210     | 18    | 4           | 3.2         | 52                    | 5.7                        |
| 106..... | 235     | 22    | 5           | 3.6         | 47                    | 6.1                        |
| 107..... | 285     | 26    | 6           | 4.2         | 48                    | 6.2                        |
| 98.....  | 316     | 30.5  | 6           | 5           | 53                    | 6.1                        |
| 99c..... | 340     | 34.5  | 6           | 4.75        | 56.6                  | 7.2                        |

| No.      | Nasal divided. | Nasal suture rises. | Scale rows. | Preocular touches second labial. | Collection.   |
|----------|----------------|---------------------|-------------|----------------------------------|---------------|
| 100..... | Yes            | 2d labial           | 26          | Yes                              | E. H. Taylor. |
| 101..... | Yes            | do                  | 26          | Yes                              | Do.           |
| 108..... | Yes            | do                  | 26          | Yes                              | Do.           |
| 102..... | Yes            | 1st labial          | 26          | Yes                              | Do.           |
| 103..... |                |                     | 26          |                                  | Do.           |
| 104..... | Yes            | 1st labial          | 26          | Yes                              | Do.           |
| 105..... | Yes            | do                  | 26          | Yes                              | Do.           |
| 106..... | Yes            | do                  | 26          | Yes                              | Do.           |
| 107..... | Yes            | do                  | 26          | Yes                              | Do.           |
| 98.....  | Yes            | do                  | 26          | Yes                              | Do.           |
| 99c..... | Yes            | do                  | 26          | Yes                              | Do            |

<sup>a</sup> Mutilated.

<sup>b</sup> Tail only.

<sup>c</sup> Type.

TYPHLOPS MINDANENSIS sp. nov.

*Type*.—No. 96, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August 12, 1913, by E. H. Taylor.

*Description of type*.—Head somewhat wedge-shaped, slightly rounding to the rather sharp horizontal edge; below sloping abruptly to mouth. The anterior edge of snout rounding and not broken in outline; rostral above moderate, about as wide as long, about one-third the width of head between eyes, not reaching to level of eyes; below, the enlarged part of rostral wider than deep; prefrontal much enlarged, much wider than deep, separating nasals by a distance equal to more than a fourth of its width, deeper and more than one and a half times as large as frontal, larger than interparietal or supraocular, and separated from preocular by a distance less than that between

nasals; the frontal, the smallest head scale, about as wide as deep or a little wider, separated from ocular by a distance less than that between prefrontal and preocular; supraocular forms its shortest suture with parietal, its longest with ocular, and is narrowly distant from edge of eye; parietals enlarged, their anterior part widest, about two and a half to three times as long as wide; interparietal larger than frontal, much wider than deep, followed by a scale twice as wide as deep; 2 scales border parietals behind, slightly larger than the following body scales; nasal not completely divided by nasal cleft, which issues from a point above first interlabial suture; a small pitlike depression below each nostril; 3 labials in contact with nasal below; nasal narrows above, the end curving to a point; preocular present, very much narrower and much shorter than either nasal or ocular, its edge reaching edge of eye, in contact with a single labial below, narrowing to a point above; ocular large, touching 2 labials below; eye distinct, with pupil showing; 3 slightly enlarged postoculars; 4 upper labials; chin covered with slightly enlarged scales, about 8 or 9 between angles of mouth; 27 scale rows about neck, 26 about anterior part of body, 24 in front of anus; anterior part of median ventral scale row has more or less enlarged scales; 35 scales in a longitudinal row from anus to tip of tail; body width in total length, 53; tail width in tail length, 3.8; tail length in body length, 17.

*Color in life.*—Above grayish to brownish yellow, this color covering upper 13 scale rows, each scale with a large, dimly defined, lighter area on its tip; below lighter brownish yellow; to the eye the color appears nearly uniform; the area about and below the nostril and upper labials lighter than rest of head.

*Measurements of Typhlops mindanensis sp. nov.*

|                            | mm.  |
|----------------------------|------|
| Total length, body severed | 818  |
| Tail                       | 18   |
| Width of body              | 6    |
| Width of tail              | 4.66 |

*Remarks.*—Only the type was taken. Apparently it has no close affinity among the other Philippine species. (See remarks under *T. rugosa*.)

**TYPHLOPS CUMINGII (Gray)**

*Onychophis cumingii* GRAY, Cat. Liz. Brit. Mus. (1845) 133.

*Onychocephalus cumingii* BOETTGER, Ber. Senck. Nat. Ges. (1886) 104.

*Typhlops cumingii* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 51, pl. 3, fig. 4; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Description of species.*—(From Boulenger.) “Snout very prominent, with a narrow, subcrescentic sharp transverse edge and inferior nostrils. Rostral large, its upper part longer than broad and about half the width of the head, not extending to the level of the eyes, its lower part as broad as long; nasal completely divided, the cleft proceeding from the second labial; præocular present, narrower than the nasal or the ocular, in contact with the third labial only; præfrontal not enlarged, parietals broad; eyes distinct; four upper labials. Diameter of body 48 to 52 times in the total length; tail four or five times as long as broad, ending in a spine. Twenty-four scales round the body. Olive-brown above, yellowish inferiorly.

“Total length 365 millim.”

*Remarks.*—I have been unable to find this species. The newly described *Typhlops longicauda* is related to but apparently distinct from it.

### BOIDÆ

*Boidæ*, part, GRAY, Zool. Misc. (1842) 41; Cat. Vip. Snakes (1849) 82.  
*Boidæ* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 71.

“Maxillary, palatine, and pterygoid movable; transpalatine present; pterygoid extending to quadrate or mandible; supratemporal present, attached scale-like to cranium, suspending quadrate; præfrontal in contact with nasal. Mandible with coronoid bone. Teeth in both jaws. Vestiges of pelvis and hind limbs, usually terminating in a claw-like spur visible on each side of the vent.” (*Boulenger.*)

This family is divided into two subfamilies, the Pythoninæ and Boinæ; the snakes of the former are characterized by the presence of a supraorbital bone, those of the latter by the absence of a supraorbital bone and of premaxillary teeth. The Pythoninæ are confined largely to the Old World. A single genus is found in Mexico. The Boinæ, on the other hand, are distributed over both hemispheres, the larger number of genera occurring in the Western Hemisphere. The genera *Corallus* and *Boa* are found in both America and Madagascar; *Casarea*

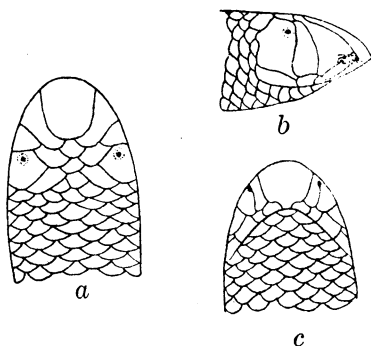


FIG. 4. *Typhlops cumingii* (Gray); after Boulenger; a, head, dorsal view; b, head lateral view; c, head, ventral view.

and *Bolieria* are known only from a small island in the Indian Ocean. *Enygrus*, which is distributed over Polynesia and Papua, approaches our territory in Celebes and the Moluccas.

#### PYTHONINÆ

Supraorbital bone present.

*Nardoa*, *Liasis*, *Chondropython*, and *Python* occur in the East Indian and Australian regions, but only the last is known to enter the Philippines.

#### Genus PYTHON Daudin

*Python* DAUDIN, Hist. Rept. 5 (1803) 226; WAGLER, Syst. Amph. (1830) 168; SCHLEGEL, Phys. Serp. 2 (1837) 402; DUMÉRIL and BIBRON, Erp. Gén. 6 (1844) 392; GRAY, Cat. Vip. Snakes (1849) 87; GÜNTHER, Rept. Brit. India (1864) 329; JAN, Icon. Gén. Ophid. (1864) 95; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; BOULENGER, Fauna Brit. India, Rept. (1890) 245; Cat. Snakes Brit. Mus. 1 (1893) 81; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 439; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Constrictor* WAGLER, Syst. Amph. (1830) 168.

*Morelia* GRAY, Zool. Misc. (1842) 43; DUMÉRIL and BIBRON, Erp. Gén. 6 (1844) 383.

*Aspidoboa* SAUVAGE, Bull. Soc. Philom. VII 8 (1884) 143.

*Hypaspistes* OGILBY, Rec. Aust. Mus. 1 (1891) 193.

“Præmaxillary bone toothed. Anterior maxillary and mandibular teeth very long, gradually decreasing in size. Head distinct from neck; end of snout covered with shields, upper surface of head with symmetrical shields or small scales; nostril directed upwards or supero-lateral, in a large semidivided nasal, which is separated from its fellow by a pair of internasals; rostral and anterior upper labials with deep pits; some of the lower labials also pitted. Eye moderate, with vertical pupil. Body more or less compressed; scales small, smooth. Tail moderate or short, prehensile; subcaudals all or greater part in two rows.” (*Boulenger.*)

The genus is widely distributed over Africa, southeastern Asia, Papua, and Australia. Only the widely distributed *Python reticulatus* (Schneider) is known to occur in the Philippines.

#### PYTHON RETICULATUS (Schneider)

*Boa reticulatus* SCHNEIDER, Hist. Amph. 2 (1801) 264; Denkschr. Ak. Münch. 7 (1821) 118; DAUDIN, Hist. Rept. 5 (1803) 116.

*Boa rhombeata* SCHNEIDER, Hist. Amph. 2 (1801) 266.

*Boa phrygia* SHAW, Zool. 3 (1802) 348, pl. 97.

*Coluber javanicus* SHAW, Zool. 3 (1802) 441.

*Python schneideri* MERREM, Tent. Syst. Amph. (1820) 89; BOIE, Isis (1827) 515; GUERIN, Icon. Reg. Anim., Rept., Pl. 21, fig. 1; SCHLEGEL, Phys. Serp. 2 (1837) 415, pl. 15, figs. 5-7.

*Python reticulatus* GRAY, Zool. Misc. (1842) 44; DUMÉRIL and BIBRON, Erp. Gén. 6 (1844) 426; CANTOR, Cat. Mal. Rept. (1847) 55; GRAY, Cat. Vip. Snakes (1849) 87; PETERS, Mon. Berl. Ak. (1861) 689; GÜNTHER, Rept. Brit. India (1864) 330; JAN, Icon. Gén. (1864) 97, pl. 6; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 205; MARTENS, Preus. Exped. O. Asien Zool. 1 (1876) 197; THEOBALD, Cat. Rept. Brit. India (1876) 205; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; BOULENGER, Fauna Brit. India, Rept. (1890) 246; Cat. Snakes Brit. Mus. 1 (1893) 85; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 439; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 355.

*Description of species.*—(From No. 426, Bureau of Science collection; collected on Polillo Island, October, 1909, by C. Canonizado). Rostral higher than wide, visible from above, with 2 deep, curved, elongate pits; 2 regular internasals, longer than wide, their mutual suture distinctly shorter than those formed with nasals, their suture with rostral about equal to suture between nasal and rostral; nasals roughly triangular, nostril pierced posteriorly; a deep suture enters nostril from above, which nearly divides the scale into two parts; 2 large regular prefrontals, widest along their mutual suture, very much larger than internasals, in contact with posterior part of nasal and with a scale which is intercalated between preocular and prefrontal; the latter scale lies diagonally, is rather rectangular in shape, and is in contact with frontal, supraocular (on one side), preocular and 2 loreals (broken into two parts on right side); frontal divided, smaller than prefrontals, lying between and somewhat anterior to eyes; supraocular large, about as wide as long; 3 loreal scales, the anterior lying between nasal and third labial, touching second and third labials; second loreal largest, touching 3 labials; third smallest, touching only fifth labial; 2 preoculars, upper very large, three or four times the size of lower, and in contact with fifth and sixth labials; lower touching sixth and seventh labials; 13 upper labials, the seventh, largest, entering eye; first 4 with deep pits diagonally elongate; 2 postocular scales in parietal region, small, very irregular, larger than body scales; temporals slightly smaller; mental small, triangular; 23 lower labials, first 11 much elongated, second, third, and fourth with small round pits; thirteenth to nineteenth inclusive pitted with rounded pits; chin shields small, indistinguishable, mental groove not especially distinct; scales on body small, the median dorsal rows smallest, in 77 rows around widest part of body; the scales in the row bordering ventrals several times larger than those on middle of back; ventrals 324, rather narrow; subcaudals 91, in 2 rows; anal single; on either side of anus a small ex-

truding claw on tip of leg bone (more prominent in males); eyes small, pupil vertical.

*Color in life.*—Yellowish gray to yellowish brown above, highly iridescent, with a continuous, chainlike, zigzag marking of blue-black inclosing irregular, rhomboidal, grayish yellow spots; the black color surrounding these spots is rarely more than three scales wide; on each side a second series of small white spots inclosed by the dark color at the point where the rhombs are widest; these in turn are connected by narrow marks to a dim series of markings running along the outer edge of the ventrals and the scales bordering the ventrals; ventrals dimly blotched with grayish black; a narrow, black, median line from upper tip of rostral to the dorsal markings on neck; a temporal streak from eye to lateral neck marking; a small isolated dot of black on each side in the parietal region; chin and throat whitish; ventrals for the most part yellowish white to cream.

*Measurements of Python reticulatus (Schneider) (young).*

|                | mm.   |
|----------------|-------|
| Total length   | 2,075 |
| Snout to anus  | 1,797 |
| Tail           | 278   |
| Width of head  | 45    |
| Length of head | 70    |

*Variation.*—The number of scale rows around the body varies greatly at the various parts of the body; in Philippine specimens the variation of the number of rows in the widest part is from 74 to 78; of the ventrals, 317 to 335; and of the subcaudals, 80 to 93.\*

The number of upper labials varies from 10 to 13, of lower labials from 20 to 23. In all specimens examined the first 4 upper labials were pitted; the second, third, and sometimes the fourth lower labials were pitted with small rounded pits; the thirteenth to eighteenth lower labials were usually pitted. The number of postoculars is variable; as few as 2 scales, and as many as 5 occur. The seventh labial almost invariably enters the eye.

The scales on the head are variable, particularly the element lying between the prefrontals and the preocular, which is frequently broken; the frontal is usually divided in Philippine specimens, and frequently the anterior part is broken.

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\* According to Boulenger's Catalogue the range of ventrals is as follows: Scale rows, 69 to 79; ventrals, 297 to 330; subcaudals, 78 to 102.

The color of the young is similar to that of the adult. The belly frequently assumes a bright orange color. In very young specimens there are often black dots on either side of the median black line on the head.

*Remarks.*—This snake attains a length of at least 9 meters. It is not at all improbable that specimens of larger size are occasionally found. All records of specimens longer than 8 or 9 meters should be verified beyond a doubt, for it must be remembered that the skin is elastic and can be stretched considerably when freshly removed from the snake. Measurements of skins therefore are not necessarily authentic for those of the living snake.

Superstitious beliefs are probably more common regarding this snake than any other in the Philippines. Fabulous stories are told of its size; of snakes 20 to 30 meters in length having been killed or seen, with body height that of a man; or of grown carabaos having been eaten whole by a single reptile.

That these large constrictors of 8 or 9 meters can easily kill a man or smaller animals is evident from their strength and size. There are on record a few cases of such occurrences, but they are rare. It is possible that they could kill a carabao if coiled about the neck; but that a snake could eat one is absurd.

Many regard this snake as poisonous which, needless to say, it is not. The flesh is white and is relished by many Filipinos. Many of the rural people have young specimens in their houses for protection from rats.

They feed on a great variety of animals, preferring smaller mammals and the young of certain of the larger ones, such as monkeys, deer, pigs, dogs, goats, as well as birds and fowls. In captivity they do very well and are probably kept as menagerie specimens more commonly than is any other snake, *Boa constrictor* of South America not excepted. Specimens kept in the Bureau of Science Aquarium are fed a small goat once each month.

Specimens are most frequently taken along rivers and they appear to be somewhat aquatic in their habits. They usually live in hollow trees, in hollow trunks of fallen trees, in holes in the banks of streams, or in caves. They lay their eggs usually in the hollow trunks of fallen trees and incubate them by encircling them with the coils of the body.

The species is found on all the larger Philippine islands and probably most of the smaller ones. It is known from Luzon,

Mindoro, Polillo, Panay, Negros, Cebu, Bohol, Leyte, Samar, Palawan, Mindanao, and Basilan. It was reported as occurring in Jolo and Tawitawi, but I was unable to verify these last two localities. Outside of the Philippines it is known in Burma, Cochin China, Siam, Malay Peninsula, Borneo, Sumatra, Java, Celebes, Timor, and the Moluccas.

TABLE 9.—Measurements and scale counts of *Python reticulatus* (Schneider).

| No.  | Locality. | Collector.    | Age. | Length. | Tail. | Head width. | Head length. | Ventrals. | Subcaudals. |
|------|-----------|---------------|------|---------|-------|-------------|--------------|-----------|-------------|
|      |           |               |      | mm.     | mm.   | mm.         | mm.          |           |             |
| 65   | Mindanao  | E. H. Taylor  | yg   | 689     | 96    | 21          | 33           | 326       | 80          |
| 64   | do        | do            | yg   | 915     | 120   | 23          | 39           | 335       | 81          |
| 330  | do        | do            | yg   | 870     | 126   | 24          | 38           | 325       | 92          |
| 425  | Polillo   | C. Canonizado |      | 2,237   | 260   | 48          | 75           | 317       | 88          |
| 426  | do        | do            | yg   | 2,175   | 278   | 45          | 70           | 324       | 91          |
| 427  | Manila    | do            | yg   | 2,452   | 285   | 50          | 79           | 323       | 82          |
| 429  | do        | do            | yg   | 1,560   | 185   | 32          | 64           | 322       | 79          |
| 432  | Mindanao  | E. H. Taylor  | yg   | 1,572   | 190   | 33          | 65           | 328       | 89          |
| 826  | Polillo   | C. Canonizado | yg   | 865     | 120   | 22          | 38           | 323       | 91          |
| 5113 | Mindanao  | E. H. Taylor  | yg   | 1,044   | 150   | 27          | 44           | 317       | 93          |

| No.  | Anal. | Labial enters eye. | Loreals. | Upper labials. | Upper labials pitted. | Lower labials. | Lower labials pitted. | Preoculars. | Postoculars. | Scale rows. | Collection.        |
|------|-------|--------------------|----------|----------------|-----------------------|----------------|-----------------------|-------------|--------------|-------------|--------------------|
| 65   | 1     | 7                  | 3        | 10-11          | 1-4                   | 21-23          | 13-17                 | 2           | 4-5          | 76          | E. H. Taylor.      |
| 64   | 1     | 7                  | 3        | 13-13          | 1-4                   | 23-23          | 13-18                 | 2           | 3-4          | 74          | Do.                |
| 330  | 1     | 7                  | 3        | 13-13          | 1-4                   | 23-23          | 13-18                 | 2           | 3-4          | 77          | Do.                |
| 425  | 1     | 7                  | 3        | 13-13          | 1-4                   | 21-21          | 13-18                 | 2           | 3-3          | 80          | Bureau of Science. |
| 426  | 1     | 7                  | 8        | 13-13          | 1-4                   | 21-22          | 13-18                 | 2           | 2-2          | 77          | Do.                |
| 427  | 1     | 7                  | 3        | 12-13          | 1-4                   | 23-23          | 13-18                 | 2           | 3-3          | 80          | Do.                |
| 429  | 1     | 7                  | 3        | 13-13          | (*)                   |                |                       | 2           | 3-3          | 78          | Do.                |
| 432  | 1     | 7                  | 3        | 13-13          | 1-4                   | 22-23          | 13-18                 | 2           | 3-3          | 76          | Do.                |
| 826  | 1     | 6                  | 3        | 12-12          | 1-4                   | 21-20          | 11-15                 | 2           | 3-3          | 81          | Do.                |
| 5113 | 1     | 7                  | 3        | 14-14          | 1-4                   | 22-23          | 13-18                 | 2           | 2-2          | 71          | E. H. Taylor.      |

\* Head mutilated.

## XENOPELTIDÆ

*Imbricatæ*, part., BOIE, Isis (1827) 510.

*Tortricidæ*, part., JAN, Elenco Sist. Ofid. (1863) 18.

*Xenopeltidæ* COPE, Proc. Acad. Nat. Sci. Philadelphia (1864) 230;  
 GÜNTHER, Rept. Brit. India (1864) 180; COPE, Proc. Am. Phil. Soc. 23  
 (1886) 482; BOULENGER, Fauna Brit. India, Rept. (1890) 275; Cat.  
 Snakes Brit. Mus. 1 (1893) 167.

Cranial bones more or less solidly united; transpalatine present; pterygoid extending to quadrate; prefrontal in contact with nasal. Mandible without coronoid bone. Teeth in jaws, palate, and premaxillary.

This family contains one genus and one species.

### Genus XENOPELTIS Reinwardt

*Xenopeltis* REINWARDT, in Boie, Isis (1827) 564; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 28; GÜNTHER, Rept. Brit. India (1864) 180; JAN, Icon. Gén. (1865) 57; BOULENGER, Fauna Brit. India, Rept. (1890) 276; Cat. Rept. Brit. Mus. 1 (1893) 167, fig. 10.

*Tortrix*, part., SCHLEGEL, Phys. Serp. 2 (1837) 1.

"Teeth small, equal, closely set, and very numerous (4 on each side of the præmaxillary, 33-38 in each maxillary, 35 or 36 in each ramus of the mandible). Dentary bone attached loosely to the apex of the articular and movable on it. Head not distinct from neck; eye small, with vertically elliptic pupil. Nostril between two small nasals; frontal in contact with a large ag[z]ygous interparietal shield, which is in the middle between four parietals. A mental groove. Body cylindrical; scales smooth, in 15 rows; ventrals large; tail short, subcaudals in two rows." (*Boulenger.*)

This genus has a single known species, *Xenopeltis unicolor*. It attains a length of at least 1 meter. It is rare in the Philippines and is probably confined to Palawan and the Sulu Archipelago. Known also in southern Asia and the Malay Archipelago.

### XENOPELTIS UNICOLOR Reinwardt

#### PLATE 2

*Xenopeltis unicolor* REINWARDT, Boie, Isis (1827) 564; CANTOR, Cat. Mal. Rept. (1847) 54; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 28; GÜNTHER, Rept. Brit. India (1864) 180; JAN, Icon. Gén. 57 (1865) 1, 9, pl. 5; THEOBALD, Cat. Rept. Brit. India (1876) 140; BOULENGER, Fauna Brit. India, Rept. (1890) 276, fig. 85; Cat. Snakes Brit. Mus. 1 (1893) 168, fig. 10; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 106; GRIFFIN, Philip. Journ. Sci. § D 13 (1918) 259.

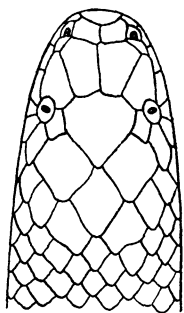
*Xenopeltis concolor* REINWARDT, in Boie, Isis (1827) 564.

*Xenopeltis leucocephala* REINWARDT, in Boie, Isis (1827) 564.

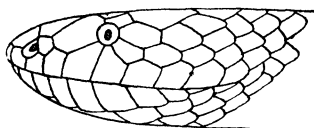
*Tortrix xenopeltis* SCHLEGEL, Phys. Serp. 2 (1837) 20, pl. 1, figs. 8-10; Abbild. (1844) pl. 35.

*Description of species.*—(From No. 738, Bureau of Science collection; collected at Iwahig, Palawan, January 8, 1909, by C. M. Weber.) Head much flattened, somewhat wedge-shaped, not distinct from neck; snout rounded; scales on head imbricate;

rostral wider than high, visible from above, pointed behind; internasals small, wider than deep, narrowed medially, the suture between them about one-third that between prefrontals; prefrontals longer than wide, rounding behind, their mutual suture



a



b

FIG. 5. *Xenopeltis unicolor* Reinwardt; after Boulenger; a, head, dorsal view; b, head, lateral view.

longest, their shortest suture with posterior nasal; frontal as wide as long, equal in length to its distance from end of snout; parietals broken into 5 scales, none as large as frontal, but the 3 bordering frontal largest; interparietal a little larger than anterior or posterior parietals; a sixth scale borders interparietal behind and is smallest, a little larger than body scales; nasal divided, nostril nearly surrounded by anterior part, posterior part largest; loreal (or preocular) very large, broadly entering eye and forming a broad suture with frontal, bordered by 2 labials below; supraocular present, very small, less than one-eighth the size of frontal, less than either of the 2 postoculars; 2 anterior temporals,

the lower in contact with both postoculars, the upper with one; 3 posterior temporals; 8 upper labials, fourth and fifth entering eye (only the fourth on the left side); first labial in contact with internasal; 8 lower labials, 3 in contact with the single pair of chin shields; scales in 15 rows, smooth, without apical pits, the median dorsals smallest, the outer scale row largest and ventral; ventrals, 178, comparatively narrow; anal divided; subcaudals, 29; the scale immediately in front of anal scale much enlarged, and the subcaudal scale behind anus single.

*Color in alcohol.*—Above purplish brown, each scale lighter on the edges, the light color becoming more pronounced laterally and appearing as longitudinal dotted lines; the second outer row of scales has only a dim brownish spot on each scale; the first row has no dark color, but is yellowish; lower labials with brownish purple spots on each scale; dark spots on chin shields; belly immaculate; underside of tail with large purplish spots for more than half its length; a broad, dim, lighter nuchal collar.

*Measurements of Xenopeltis unicolor Reinwardt.*

|                | mm. |
|----------------|-----|
| Total length   | 730 |
| Tail           | 84  |
| Width of head  | 15  |
| Length of head | 25  |

*Variation.*—Practically no variation is evident in color or marking save that in the young the purple is more pronounced and the collar is almost pure yellowish white. The specimen here described is abnormal in having only the fourth labial entering the eye on one side, and only minutely on the other side. The fourth and fifth labials enter the eye in all specimens examined except one (No. 736, Bureau of Science collection) in which the fourth labial alone enters the eye on one side. Boulenger\* gives the range of ventrals as 166 to 193; of subcaudals, 26 to 31. It is significant that in the six specimens listed in the attached table the subcaudal count is identical.

TABLE 10.—*Measurements and scale counts of Xenopeltis unicolor Reinwardt.*

| No. | Sex. | Locality.            | Collector.       | Length. |     | Tail. |
|-----|------|----------------------|------------------|---------|-----|-------|
|     |      |                      |                  | mm.     | mm. |       |
| 734 | ♂    | Iwahig, Palawan..... | C. M. Weber..... | 415     | 48  |       |
| 735 | ♂    | do.....              | do.....          | 365     | 42  |       |
| 736 | ♀    | do.....              | do.....          | 672     | 80  |       |
| 737 | ♀    | do.....              | do.....          | 655     | 80  |       |
| 738 | ♀    | do.....              | do.....          | 735     | 84  |       |
| 739 | ♂    | do.....              | do.....          | 610     | 65  |       |

| No. | Ventrals. | Subcaudals. | Upper labials. | Lower labials. | Scale rows. | Labials enter eye.                        | Collection.        |
|-----|-----------|-------------|----------------|----------------|-------------|---|--------------------|
| 734 | 181       | 29          | 8              | 8              | 15          | 4, 5                                      | Bureau of Science. |
| 735 | 179       | 29          | 8              | 8              | 15          | 4, 5                                      | Do.                |
| 736 | 177       | 29          | 8              | 8              | 15          | $\begin{bmatrix} 4, 5 \\ 4 \end{bmatrix}$ | Do.                |
| 737 | 174       | 29          | 8              | 8              | 15          | 4, 5                                      | Do.                |
| 738 | 178       | 29          | 8              | 8              | 15          | $\begin{bmatrix} 4, 5 \\ 4 \end{bmatrix}$ | Do.                |
| 739 | 181       | 29          | 8              | 8              | 15          | 4, 5                                      | Do.                |

*Remarks.*—The species was discovered in the Philippines by Mr. C. M. Weber in Palawan, and was first recorded by Griffin.†

\* Cat. Snakes Brit. Mus. 1 (1893) 168.

† Loc. cit.

I obtained a specimen on Bongao Island, Sulu Archipelago. This specimen is of a dark slate or bluish slate color; otherwise it agrees fairly well with the Palawan specimens. It is known in the Philippines from these two localities only. Outside of the Philippines it is known from India, Burma, Siam, Malay Peninsula, Nias, Borneo, Celebes, Sumatra, and Java. In the Philippines it is rare, as it is said to be in Java also.\*

### NATRICIDÆ

"Facial bones movable; præfrontal not in contact with nasal; transpalatine present; pterygoid extending to mandible or quadrate; supratemporal present, attached scale-like to the skull and suspending quadrate; maxillary horizontal, not movable perpendicularly to the transpalatine. Mandible without coronoid bone. Both jaws toothed." (*Boulenger*.)†

The family is divided into the following subfamilies: *Acrochordinæ*, *Natricinæ*, *Rachiodontinæ*, *Homalopsinæ*, *Coronellinæ*, *Boiginæ*, *Elachistodontinæ*, and *Langahinæ*. Representatives of six of these subfamilies are to be found in the Philippines, and they may be distinguished as follows:

#### *Key to the Philippine subfamilies of the Natricidæ.*

*a*<sup>1</sup>. Hypapophyses present throughout the vertebral column.

*b*<sup>1</sup>. All maxillary teeth solid.

*c*<sup>1</sup>. Postfrontal bone produced over the supraorbital region; scales not or but slightly imbricate..... *Acrochordinæ* (p. 76).

*c*<sup>2</sup>. Postfrontal bone not produced over the supraorbital region; scales imbricate..... *Natricinæ* (p. 78).

*b*<sup>2</sup>. Posterior maxillary teeth grooved.

*c*<sup>1</sup>. Nostrils valvular, on upper side of snout..... *Homalopsinæ* (p. 110).

*c*<sup>2</sup>. Nostrils not valved, lateral..... *Langahinæ* (p. 116).

*a*<sup>2</sup>. Hypapophyses absent in posterior dorsal vertebra.

*b*<sup>1</sup>. All maxillary teeth solid..... *Coronellinæ* (p. 117).

*b*<sup>2</sup>. Posterior maxillary teeth grooved..... *Boiginæ* (p. 195).

The *Natricinæ* and the *Coronellinæ* constitute the bulk of the harmless Philippine snakes. The two subfamilies together are equivalent to Boulenger's family *Colubridæ*.

### ACROCHORDINÆ

*Acrochordinæ* BOULENGER, Fauna Brit. India, Rept. (1890) 354; Cat. Snakes Brit. Mus. 1 (1893) 172.

"Postfrontal bone produced over the supraorbital region. Maxillary and dentary bones armed with solid teeth along their

\* Barbour, loc. cit.; Schlegel, loc. cit.

† Boulenger's definition of the *Colubridæ*, from Cat. Snakes Brit. Mus. 1 (1893) 169.

whole length; palatines and pterygoids toothed. Hypapophyses developed throughout the vertebral column. Scales not or but slightly imbricate." (*Boulenger.*)

This subfamily, consisting of several genera, is distributed over southeastern Asia, the East Indies, and Central America. Only *Chersydrus* is known in the Philippines. *Xenodermus*, *Acrochordus*, *Stoliczkaia*, and *Anoplohydrus* enter the East Indies, the first with a single species extending from Siam and the Malay Peninsula to New Guinea; the second extending from the Malay Peninsula to Java and Sumatra; the third has been found in Borneo, but is apparently absent from the other East Indian islands; and the fourth is from Sumatra. It is significant that most of these genera are monotypic.

#### Genus *CHERSYDRUS* Cuvier

*Hydrus*, part., SCHNEIDER, Hist. Amph. 1 (1799) 243.

*Chersydrus* CUVIER, Reg. Anim. 2 (1817) 75; GRAY, Cat. Vip. Snakes (1849) 60; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 40; GÜNTHER, Rept. Brit. India (1864) 336; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; BOULENGER, Fauna Brit. India, Rept. (1890) 355; Cat. Snakes Brit. Mus. 1 (1893) 173.

*Acrochordus*, part., SCHLEGEL, Phys. Serp. 2 (1837) 424.

*Potamophis*, part., SCHMIDT, Abh. Naturw. Hamb. 2 (1852) 75.

"Teeth subequal, 12 to 15 in each maxillary. Head not distinct from neck, small, covered with granular, juxtaposed scales; nostrils close together on the top of the snout; eye very small, with vertically subelliptic pupil. Body stout, compressed; scales very small, juxtaposed, rhomboidal, with a short tubercle-like keel, spinose on the belly; no ventral shields; a fold of the skin running along the median line of the abdomen. Tail short, compressed, prehensile, scaled like the body." (*Boulenger.*)

For the distribution of the family see that of the single species.

#### *CHERSYDRUS GRANULATUS* (Schneider)

##### PLATE 3, FIG. 1

*Hydrus granulatus* SCHNEIDER, Hist. Amph. 1 (1799) 243.

*Acrochordus fasciatus* SHAW, Zool. 3 (1802) 576, pl. 130; SCHLEGEL, Phys. Serp. 2 (1837) 429, pl. 14, figs. 14-16.

*Pelamis granulatus* DAUDIN, Rept. 7 (1803) 370.

*Acrochordus granulatus* CANTOR, Cat. Mal. Rept. (1847) 59.

*Chersydrus granulatus* GRAY, Cat. Vip. Snakes (1849) 61; GÜNTHER, Rept. Brit. India (1864) 336; THEOBALD, Cat. Rept. Brit. India (1876) 186; BOULENGER, Fauna Brit. India, Rept. (1890) 355, fig.; Cat. Snakes Brit. Mus. 1 (1893) 174; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 255.

*Chersydrus annulatus* GRAY, Cat. Snakes (1849) 61.

*Potamophis fasciata* SCHMIDT, Abh. Naturw. Hamb. 2 (1852) 75.

*Chersydrus fasciatus* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 41.

*Description of species.*—(From No. 773, Bureau of Science collection; collected in Manila Bay.) Head narrow, not distinct from neck; eyes small; body compressed; rostral wanting or reduced greatly; no regular head scales; nostrils nearly as large as eyes, valvular, separated from each other by a single narrow scale; the row of scales above the row bordering mouth largest; anterior row of scales on lower jaw broken into two deep grooves, scales adjoining the scale row bordering mouth much enlarged; no distinct chin shields; eye surrounded by about 11 small scales, about 11 scales in a row between eyes; scales small, juxtaposed, tubercled, about 100 rows around widest part of body, those on back two or three times as large as lateral scales; no ventral shields; scales along ventral surface form a small, finely serrated fold; tail short, rather compressed; no subcaudals; neck and head less than half as deep as greatest depth of body.

*Color in life.*—Above lead color with lateral indistinct markings of yellowish white, very slightly evident dorsally; the slight ventral fold whitish, terminating in a larger white spot under chin; dim light markings in occipital region; anal region white; no line under tail.

*Measurements of Chersydrus granulatus (Schneider).*

|                     | mm. |
|---------------------|-----|
| Total length        | 785 |
| Snout to vent       | 703 |
| Tail                | 82  |
| Width of head       | 14  |
| Length of head      | 20  |
| Depth of neck       | 15  |
| Greatest body depth | 35  |

*Variation.*—The young are blackish brown, very distinctly marked on the sides with white transverse bars, which usually fail to join dorsally; the white bars are widest laterally; the head has two small white dots between and anterior to the eyes; a row of larger white dots across the occipital region.

*Remarks.*—The species attains a length of 1 meter or more. It is extremely common along the shores and fresh-water streams near the seacoast. Females give birth to as many as ten young at one time. The species is entirely harmless.

NATRICINÆ

Hypapophyses present throughout the vertebral column. All maxillary teeth solid; the postfrontal bone not produced over the supraorbital region. Scales imbricate. Teeth on the entire length of the maxillary and dentary bones.

## Key to the Philippine genera of the Natricinæ.\*

- a<sup>1</sup>. Subcaudals double; maxillary teeth equal, or last two or three enlarged.  
 b<sup>1</sup>. Eye small, pupil round; scales smooth, without apical pits; snout obtuse..... *Sibynophis* Fitzinger (p. 79).  
 b<sup>2</sup>. Eye large, pupil round; scales nearly all keeled, usually with apical pits; snout obtuse..... *Natrix* Laurenti (p. 82).  
 b<sup>3</sup>. Eye moderate, pupil vertically elongate; snout pointed; scales smooth, no apical pits..... *Oxyrhabdium* Boulenger (p. 99).  
 a<sup>2</sup>. Subcaudals single; anterior maxillary teeth enlarged and separated from those following by a short interspace; eye moderate, pupil round; snout obtuse; scales smooth, without apical pits.  
*Cyclocorus* Duméril and Bibron (p. 105).

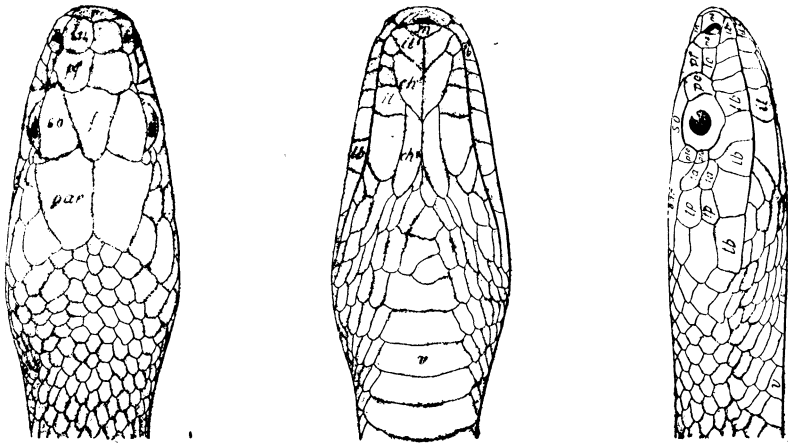


FIG. 6. Typical Natricinæ head; after Griffin; *Dendrelaphis terrificus* (Peters), from Griffin's figure of *D. caeruleatus*; *ch*, chin shield; *f*, frontal; *il*, inferior labial; *in*, internasal; *lb*, superior labial; *lo*, loreal; *m*, mental, or symphysial; *n*, nasal; *par*, parietal; *pf*, prefrontal; *po*, preocular; *pto*, postocular; *r*, rostral; *so*, supraocular; *ta*, anterior temporal; *tp*, posterior temporal; *v*, ventral.

## Genus SIBYNOPHIS Fitzinger

- Sibynophis* FITZINGER, Syst. Rept. (1843) 26; STEJNEGER, Proc. U. S. Nat. Mus. 38 (1910) 102.  
*Herpetodryas*, part., SCHLEGEL, Phys. Serp. 2 (1837) 173.  
*Enicognathus* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 328.  
*Ablabes*, part., GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 27; Rept. Brit. India (1864) 223.  
*Enicognathus*, part., JAN, Arch. Zool. Anat. Phys. 2 (1863) 266.  
*Henicognathus* COPE, Journ. Acad. Nat. Sci. Philadelphia 8 (1876) 138; part., BOCOURT, Miss. Sc. Mex., Rept. (1886) 625.  
*Polyodontophis* BOULENGER, Fauna Brit. India, Rept. (1890) 301; Cat. Snakes Brit. Mus. 1 (1893) 181; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 256.

\*The characters given here may not apply to extra-Philippine species of the genera.

"Teeth very numerous and closely set, 30 to 50 in each maxillary, equal in size. Dentary bone completely detached from the articular posteriorly. Head short, not or but slightly distinct from neck; eye moderate or rather small, with round pupil. Body cylindrical, elongate; scales smooth, without apical pits, in 17 or 19 rows. Tail moderate or long; subcaudals in two rows. Hypapophyses developed throughout the vertebral column." (*Boulenger*.)

The occurrence in the Philippines of a species of this genus is somewhat unusual, as no other member of the genus appears to have been discovered in any of the East Indian islands. Species occur in Madagascar, Comoro Islands, southeastern Asia, and Central America; it offers a good example of discontinuous distribution.

The Philippine species, *Sibynophis bivittatus*, is small and harmless; it is not recognized by people in Busuanga as being a different snake from the poisonous *Doliophis bilineatus*, which occurs on the same island, the name *odto-odto* \* being applied to both species. They regard both as deadly poisonous.

#### SIBYNOPHIS BIVITTATUS (*Boulenger*)

##### PLATE 10, FIG. 1

*Polyodontophis bivittatus* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 82; Cat. Snakes Brit. Mus. 3 (1896) 597; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 256.

*Description of species.*—(From an unnumbered specimen in Santo Tomás Museum; collected in Palawan, collector and date unknown.) Rostral twice as broad as high, only a very small part visible from above, forming its largest suture with internasals and its smallest with first labial; internasal large, apparently bordering nostril, about as broad as long, their mutual suture diagonal; prefrontals wider than long, also forming a diagonal mutual suture (left prefrontal broadly in contact with right internasal), in contact with and forming coequal sutures with posterior nasal, loreal, preocular, and supraoculars; frontal elongate, shield-shaped, not quite twice as long as broad, much longer than its distance to end of snout, as long as parietals or minutely shorter, wider and slightly longer than supraoculars; parietals longer than wide, in contact with both postoculars and 2 temporals; nasal divided, internasal bordering nostril; pos-

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\* This name is usually applied to species of *Typhlops*, chiefly *Typhlops braminus*, in Negros and other Visayan islands. It is regarded by the Visayans as deadly poisonous.

terior nasal highest and largest; loreal as long as deep, smaller than preocular; latter much higher than wide, much wider at top than bottom; supraoculars twice as long as wide; 2 small postoculars, lower touching 2 labials; temporals,  $2 + \frac{1}{2}$ , lower anterior largest, wedged between sixth and seventh labials; 8 upper labials, last much the largest; third, fourth, and fifth entering eye, progressing in size from first; 8 lower labials, 4 touching first chin shields, which are longer and wider than second; eye rather large; ventrals, 145; anal divided; subcaudals, 93 in 2 rows; scales in 17 rows, smooth, without apical pits.

*Color in alcohol.*—Above dark reddish brown, which reaches laterally to outer row of scales but does not include them; two white stripes begin behind parietals and continue to extreme tip of tail, each stripe covering one scale row and parts of the two adjoining rows; ventrally immaculate yellowish white; a broad yellow area between eyes involving larger part of frontals and supraoculars; two small yellow spots on prefrontals, and one on each upper labial; some small yellow spots on parietals; chin dirty whitish.

*Measurements of Sibynophis bivittatus (Boulenger).*

|               | mm. |
|---------------|-----|
| Total length  | 460 |
| Body to vent  | 299 |
| Tail          | 161 |
| Width of head | 8   |

*Variation.*—There are three specimens in the Santo Tomás Museum, all from Palawan. Like the types in the British Museum, all save the described specimen have mutilated tails, which fact seems significant. The specimens agree with the type description save in the following characters: The ground color is dark reddish brown instead of black, and the color barely extends on the outer scale rows, and there are no spots on the ventrals. In two of the specimens the white lines continue to the eyes. In Busuanga, on the seashore, near the small settlement of Minuit, I recently captured a specimen having the following scale counts: Ventrals, 152; anal, divided; subcaudals, 106; upper labials, 8; lower labials, 9; scale rows, 17; fourth and fifth labials entering eye. The diagonal direction of the suture between the prefrontals is evident and leaves the left prefrontal in contact with the right internasal. This strange anomaly is present in all four specimens examined. I suspect that this is the normal condition, although it was not mentioned as occurring in the type.

*Color in life.*—Above black with two cream-white stripes beginning behind parietal and continuing to tip of tail; outer scale row slightly greenish gray instead of black; head reddish brown with a light interorbital stripe or blotch washed with salmon red; a few creamy white dots on parietals and prefrontals; each labial with a large paper-white spot; above labial spots darker; chin muddy white; below uniform greenish yellow.

Obviously this is a rare species. It closely resembles \* *Doliophis bilineatus* Boulenger and *Dryocalamus philippinus* Griffin, both of which are known to inhabit the Palawan group of islands.

TABLE 11.—Measurements and scale counts of *Sibynophis bivittatus* (Boulenger).

| No.   | Locality.     | Collector.     | Length, to vent. | Ventrals. | Upper labials. | Preoculars. | Postoculars. | Labials entering eye. | Collection.        |
|-------|---------------|----------------|------------------|-----------|----------------|-------------|--------------|-----------------------|--------------------|
|       |               |                | mm.              |           |                |             |              |                       |                    |
| ----- | Palawan-----  | Unknown-----   | 370              | 155       | 8              | 1           | 2            | 3, 4, 5               | Santo Tomás.       |
| ----- | do-----       | do-----        | 260              | 146       | 8              | 1           | 2            | 3, 4, 5               | Do.                |
| ----- | do-----       | do-----        | (*)              |           | 8              | 1           | 2            | 3, 4, 5               | Do.                |
| 559   | Busuanga----- | E. H. Taylor-- | 280              | 152       | 8              | 1           | 2            | 4, 5                  | Bureau of Science. |

\* Mutilated.

### Genus NATRIX Laurenti

*Natrix*, part., LAURENTI, Syn. Rept. (1768) 73.

*Tropinotus* KUHL, Isis (1822) 473.

*Tropidonotus* KUHL, Férussac, Bull. Sci. Nat. 2 (1824) 81; BOIE, Isis (1826) 205; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 192.

*Tropidonotus*, part., SCHLEGEL, Phys. Serp. 2 (1837) 297; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 549; GÜNTHER, Cat. Col. Snakes (1858) 59; Rept. Brit. India (1864) 258; JAN, Arch. Zool. Anat. Phys. 3 (1865) 203; BOULENGER, Fauna Brit. India, Rept. (1890) 341.

*Natrix* BONAPARTE, Mem. Acc. Torin. II 2 (1839) 436; COPE, Proc. U. S. Nat. Mus. 11 (1888) 392; 14 (1892) 667; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 263, 264.

*Rhabdophis* FITZINGER, Syst. Rept. (1843) 27.

*Eutainia*, BAIRD and GIRARD, Serp. N. Am. (1853) 24; COPE, Proc. U. S. Nat. Mus. 14 (1892) 645.

*Steiropphis* FITZINGER, Syst. Rept. (1843) 27.

*Leptophis*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 528.

*Hydrophilophis* SCHMIDT, Abh. Naturw. Ver. Hamburg II 2 (1852).

*Nerodia* BAIRD and GIRARD, Serp. N. Am. (1853) 38.

*Regina* BAIRD and GIRARD, Serp. N. Am. (1853) 45.

\* Boulenger, loc. cit.

- Amphiesma* DUMÉRIL and BIBRON, *Erp. Gén.* 7 (1854) 724.  
*Thamnophis* COPE, *Proc. Acad. Nat. Sci. Philadelphia* (1860) 369.  
*Bothrodytes* COPE, *Proc. Am. Phil. Soc.* 23 (1886) 495.  
*Ceratophallus* COPE, *Am. Nat.* 27 (1893) 483.  
*Diplophallus* COPE, *Am. Nat.* 27 (1893) 483.

"Maxillary teeth 18 to 40, posterior longest; mandibular teeth subequal. Head usually distinct from neck; eye rather small, moderate, or large, with round pupil. Body more or less elongate, cylindrical; scales mostly keeled, in some species smooth, usually with apical pits, in 15 to 33 rows; ventrals rounded. Tail moderate or long; subcaudals in two rows. Hypapophyses developed throughout the vertebral column." (*Boulenger.*)

This large genus is distributed over Central and North America, Europe, Asia, Africa, North Australia, the Malay Archipelago, and Japan.

In the Philippines seven species are known; one of these, *Natrix stolata* (Linnæus), reported by Peters from Calumpit, Bulacan Province, Luzon, I regard as doubtful.

*Key to the Philippine species of Natrix Laurenti.*

- a*<sup>1</sup>. Maxillary teeth not more than 30, last 2 or 3 abruptly enlarged.  
*b*<sup>1</sup>. Head moderately elongate; scales in 19 rows.  
*c*<sup>1</sup>. Single anterior temporal; third, fourth, and fifth upper labials entering eye; outer scale rows smooth.... *N. stolata* (Linnæus) (p. 84).  
*c*<sup>2</sup>. Two anterior temporals; fourth, fifth, and sixth upper labials entering eye; outer scale row feebly keeled.  
*N. spilogaster* (Boie) (p. 86).  
*c*<sup>3</sup>. Two anterior temporals; 3 temporals entering eye; internasals as long as prefrontals; outer row of scales strongly keeled.  
*N. chrysarga* (Schlegel) (p. 87).  
*b*<sup>2</sup>. Head short, very distinct from neck.  
*c*<sup>1</sup>. Scales in 17 rows, third, fourth, and fifth labials entering eye.  
*N. auriculata* (Günther) (p. 89).  
*c*<sup>2</sup>. Scales in 19 rows.  
*d*<sup>1</sup>. Two anterior temporals; subcaudals, 96 to 101.  
*N. crebripunctata* (Wiegmann) (p. 91).  
*d*<sup>2</sup>. One anterior temporal; subcaudals, 64 to 71.  
*N. lineata* (Peters) (p. 92).  
*a*<sup>2</sup>. Maxillary teeth, 35 to 40; posterior but slightly enlarged; scales in 17 or 19 rows..... *N. dendrohiops* Günther (p. 95).

The snakes of this genus, as the name suggests, are somewhat aquatic; they are usually found about moist or damp situations where there are frogs, since frogs form the largest part of their food. They are wholly harmless to man. *Natrix spilogaster* is frequently captured in Manila. It is probably the best known species owing to its presence about rice paddies.

## NATRIX STOLATA (Linnæus)

*Coluber stolatus* LINNÆUS, Syst. Nat. 1 (1766) 379; DAUDIN, Rept. 7 (1803) 161.

*Elaps bilineatus* SCHNEIDER, Hist. Amph. 2 (1801) 299.

*Coluber bilineatus* DAUDIN, Rept. 7 (1803) 165.

*Natrix stolatus* MERREM, Syst. Amph. (1820) 123; STEJNEGER, Journ. Sci. Coll. Tokyo 12<sup>3</sup> (1898) 221; Bull. U. S. Nat. Mus. 58 (1907) 280 (in syn.).

*Tropidonotus stolatus* BOIE, Isis (1827) 535; SCHLEGEL, Phys. Serp. 2 (1837) 317; CANTOR, Cat. Mal. Rept. (1847) 90; PETERS, Mon. Berl. Ak. 2 (1861) 686; GÜNTHER, Rept. Brit. India (1864) 226; SWINHOE, Ann. & Mag. Nat. Hist. III 12 (1863) 225; THEOBALD, Cat. Rept. Brit. India (1876) 177; ANDERSON, An. Zool. Res. Yunnan (1879) 816; MURRAY, Zool. Sind. (1884) 379; BOETTGER, Ber. Offenb. Ver. Nat. (1888) 79; BOULENGER, Fauna Brit. India, Rept. (1890) 348, fig.; Cat. Snakes Brit. Mus. 1 (1893) 253; WALL, Proc. Zool. Soc. London (1903) 86.

*Amphiesma stolatum* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 727.

*Description of species*.—(From Stejneger, Bull. U. S. Nat. Mus.) "Rostral much broader than high, well visible from above; internasals slightly shorter than the prefrontals, very narrow in front, their suture with rostral considerably shorter than suture between rostral and first labial; prefrontals in contact with supraoculars; frontal longer than its distance from tip of snout and interparietal suture; parietals equaling the distance of eye from tip of snout; nostril large, between two subequal nasals; loreal somewhat longer than high, upper edge shorter than and parallel with lower; one preocular, not in contact with frontal; 3 postoculars; temporals 1 + 2; supralabials 8, third, fourth, and fifth entering eye, sixth and seventh largest; 5 lower labials in contact with anterior chin-shields which are shorter than the posterior; 19 rows of scales, strongly keeled except outer row, and without apical pores; 149 ventrals; anal divided; 81 pairs of subcaudals.

*"Color (in alcohol)*.—Above brownish gray with numerous narrow black crossbars alternating on each side of the median line anteriorly but continuous farther back; across this pattern two longitudinal, dorso-lateral pale bands occupying the whole of sixth scale row and the adjacent halves of fifth and seventh rows; posteriorly these bands are nearly uniformly pale, but anteriorly they exhibit a kind of chain pattern, inasmuch as the outer edges of the middle scale row are black except where the band intersects as black crossbar; below the lateral band many small irregularly alternating black spots; top of head with obscure dusky edges to the shields; no nuchal collar; supra-

labials whitish, the light color extending upward on the preocular and the lower postoculars, the vertical edges of the labials heavily margined with black as are also the preocular in front and the postoculars behind, the vertical, black edged, white bar in front of the eye being very characteristic; underside uniform whitish, each ventral with a black mark near the outer edge."

*Measurements of Natrix stolata (Linnæus).*

|                     | mm. |
|---------------------|-----|
| Total length        | 522 |
| Snout to vent       | 382 |
| Vent to tip of tail | 140 |

*Variation.*—Boulenger gives the ranges of ventrals and subcaudals as 120 to 161 and 50 to 89, respectively. Those recorded by Stejneger \* from Formosa are ventrals, 142 to 150; subcaudals, 65 to 81.

*Remarks.*—I have at hand a snake (No. 169, Bureau of Science collection) from Batan Island, just south of Formosa, which I have hesitated to refer to this species. It differs somewhat from the typical form. There are two preoculars, a single anterior temporal, and on one side the upper part of the seventh labial is broken, forming an anomalous scale. There is a light area in front of the eye, and the belly is spotted with small dark dots.

Unfortunately there is but a single specimen from this locality, and this a very young one. It would appear to be the "missing link" between *Natrix stolata* and *N. spilogaster*. In the coloration of the belly it agrees with the latter; in the presence of a single anterior temporal, with the former. I am unable to determine with certainty the presence or absence of apical pits.

A specimen of *Natrix spilogaster* which I collected at Baguio has a single anterior temporal, but there are two very small scales inserted between this and the sixth labial. Only the fourth and fifth labials enter the eye. The spotting on the belly is not so distinct as in the Batan specimen, and the outer row of scales is quite smooth; there are 159 ventrals; the tip of the tail is missing; there are two preoculars, and apical pits are present.

In two specimens of *Natrix spilogaster* in the Bureau of Science collection (Nos. 182 and 204) there is but a single anterior temporal present, but it is noticeably widened, suggesting a fusion of two scales. A third specimen (No. 192) has one anterior temporal on the right side and two on the left.

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\* Bull. U. S. Nat. Mus.

The only record of the occurrence of *Natrix stolata* in the Philippine Islands is that of Peters.\* If Peters's specimen is extant it would be well to have it examined to determine the species as well as the presence or absence of apical pits. I strongly suspect that Peters's specimen was either *Natrix spilogaster* or *N. stolata* from an extra-Philippine locality.

#### NATRIX SPILOGASTER (Boie)

##### PLATE 4, FIG. 1

*Tropidonotus spilogaster* BOIE, Isis (1827) 535; (1828) 559; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 598; GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 66; PETERS, Mon. Berl. Ak. (1861) 687; JAN, Elenco Sist. Ofid. Milan (1863) 72; Arch. Zool. Anat. Phys. 3 (1865) 225; Icon. Gén. (1868) 27, pl. 2, fig. 1; FISCHER, Arch. f. Nat. 48 (1882) 282; Jahrb. wiss. Anst. Hamburg (1885) 80; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 15; BOETTGER, Ber. Senck. Nat. Ges. (1886) 109; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 257.

*Tropidonotus quincunciatus* var. SCHLEGEL, Phys. Serp. (1837) 309; EYDOUX and GERVAIS, Voy. Favorite, Zool. (1839) 69, pl. 28.

*Natrix spilogaster* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 596; § D 5 (1910) 211; § D 6 (1911) 257; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 356.

*Description of species.*—(From No. 407, E. H. Taylor collection; collected at Manila, May 29, 1915, by E. H. Taylor.) (Adult female.) Rostral nearly twice as wide as high, narrowly visible from above; internasals as long as broad, broadly truncate anteriorly, as long as prefrontals; latter much broader than long, forming their longest suture with frontal; frontal a little longer than its distance from end of snout, four-fifths as wide as long; parietals longer than frontal, their greatest width nearly equaling length of frontal; 2 nasals, second highest; loreal moderately large, as high as deep, in contact with 2 preoculars, of which the superior is largest; supraocular a little longer than frontal and at least half as wide; 3 postoculars, subequal in size; temporals 2 + 2 + 3; 9 upper labials, fourth, fifth, and sixth entering eye; labials have the following order of size; seventh, eighth, sixth, ninth, fifth, fourth, third, second, first; 10 lower labials, 5 in contact with anterior chin shields; mental broadly triangular; 2 pairs of chin shields subequal in size; head rather thick; diameter of eye equal to its distance from nostril; scales in 19 rows, all strongly keeled except outer row, which is faintly or not at all keeled; ventrals, 150; anal double; subcaudals, 88.

\* Loc. cit.

*Color in life.*—Above olive gray, with three dark stripes running the length of body, separated by two lighter lines; light stripes are barred with lighter transverse spots at regular intervals. Each light stripe covers the equivalent of three scale rows; the dark stripes are much wider and are spotted with dark black spots, those on median stripe being largest and most conspicuous. Outer row of scales has an indistinct row of lighter spots; two nuchal light spots, quite large, of a creamy yellow; upper lip cream, with dark spots on sutures of three anterior labials; lower rim of orbit dark; chin and lower labials light, with a spot on ninth lower labial; outer edge of ventrals grayish; ventrally flesh colored, with numerous dark spots, five or six on each ventral scale.

*Measurements of Natrix spilogaster (Boie).*

|                | mm. |
|----------------|-----|
| Total length   | 735 |
| Snout to vent  | 535 |
| Tail           | 200 |
| Width of head  | 14  |
| Length of head | 23  |

*Variation.*—In the numerous specimens examined the following variations are evident: The frontal varies from one and a half to one and two-thirds times as long as broad; there are 1 or 2 preoculars; postoculars, 2, 3 or 4; temporals 2 + 2 or 2 + 3, very rarely 1 + 2 or 1 + 3. There are 5 or 6 lower labials in contact with the anterior chin shields; the ventrals vary between 147 and 155; the subcaudals vary between 80 and 91. The distinctness of the dorsal stripes varies considerably.

*Remarks.*—The species is common in Luzon. It has been reported from Negros and Palawan by Boulenger and from Mindanao by J. G. Fischer. Specimens in the collections examined are from Polillo, Luzon, and Camiguin (Babuyan Islands). The species feeds almost wholly on frogs. It is frequently encountered in the city of Manila.

**NATRIX CHRYSARGA (Schlegel)**

PLATE 4, FIG. 5

*Tropidonotus chrysargus* SCHLEGEL, Phys. Serp. 2 (1837) 312; GÜNTHER, Cat. Col. Snakes (1858) 70; FISCHER, Arch. Nat. (1885) 57, pl. 4, fig. 2; BOULENGER, Fauna Brit. India, Rept. (1890) 345; Cat. Snakes Brit. Mus. 1 (1893) 258.

*Tropidonotus junceus* CANTOR, Cat. Mal. Rept. (1847) 93; BLYTH, Journ. As. Soc. Bengal 24 (1855) 716; GÜNTHER, Rept. Brit. India (1864) 268, pl. 22, fig. F.

*Natrix chrysarga* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 265; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 257.

*Description of species.*—(From No. 163, Bureau of Science collection; collected at Iwahig, Palawan, by C. M. Weber.) Head rather elongate, distinct from neck; rostral much broader than high, visible from above; internasals longer than wide, about as long as prefrontals, the suture between them nearly equal to that between prefrontals; frontal about one and two-third times as long as broad, shorter than supraoculars, as long as its distance to end of snout, much shorter than parietals; latter much longer than broad, in contact with 1 postocular and 2 (3 on left side) temporals; nasal large, divided or nearly so; loreal about as deep as long; 1 preocular, higher than wide; eye large; 3 postoculars; 9 upper labials, fourth, fifth, and sixth entering eye, seventh and eighth largest; mental much broader than deep; 11 lower labials (the first anterior on left side broken); first pair of chin shields shorter and broader than second pair, touching first 6 labials; second pair of chin shields touching labials entire length; scales strongly keeled, in 19 rows, outer row largest; ventrals, 152; anal divided; subcaudals, 69.

*Color.*—Above grayish brown, the skin between the scales rather reddish brown; a lateral row of small brownish yellow spots from head to tail; labials with yellowish spots; chin and belly immaculate, outer edges of ventrals grayish.

*Measurements of Natrix chrysarga (Schlegel).*

|                | mm. |
|----------------|-----|
| Total length   | 825 |
| Snout to vent  | 625 |
| Tail           | 200 |
| Width of head  | 18  |
| Length of head | 30  |

*Variation.*—Not a great deal of variation obtains in the specimens examined. The counts of ventral scales vary within the limits of 150 and 160; of subcaudals, between 80 and 90. Boulenger gives 143 to 175 for the ventral range; 60 to 93 for the subcaudal range.

The young are very distinctly marked. The head is dark grayish brown, with two black-edged, white, parietal spots; there is a yellow bar on the side of the head in front of the eye, edged anteriorly with black; the labials entering the eye are yellow, edged with black; a vertical bar is present immediately behind the eye; the neck is blackish with a broad V-shaped, yellow mark crossing it from the angles of the mouth. The body is gray-brown; the five median scale rows are slightly darker than the adjoining rows, and are traversed by numerous, regular black

bars. Opposite these black bars, on the three adjoining scale rows, are small, yellowish white spots, below which on the outer scale rows is another series of black bars or spots; the ventrals have an indistinct row of dots on the outer sides, distinctly marked on the tail.

*Remarks.*—This species is as common in the Calamianes and Palawan as *Natrix spilogaster* is in Luzon. It is found in low moist situations and along small streams. It feeds on frogs and fishes. It is not regarded as poisonous by the people of Busuanga. It occurs from the eastern Himalayas through Assam, Burma, southern China and the Malay Peninsula, to Java, Sumatra, Borneo, and Palawan.

#### NATRIX AURICULATA (Günther)

##### PLATE 4, FIGS. 2 TO 4

*Tropidonotus auriculatus* GÜNTHER, Cat. Col. Snakes (1858) 80; PETERS, Mon. Berl. Ak. (1861) 687; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 261, pl. 17, fig. 1; F. MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 15; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 80; BOETTGER, Ber. Senck. Nat. Ges. (1886) 108. *Natrix auriculata* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 257.

*Description of species.*—(From No. 50, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, September 23, 1913, by E. H. Taylor.) (Adult female.) Head very short and blunt, very distinct from neck; rostral broader than deep, visible only as a narrow line from above; internasals longer than broad, narrowed anteriorly; prefrontals much broader than long, shorter than internasals; frontal about one and a half times as long as broad, longer than its distance from end of snout; parietals longer than frontal, in contact with 1 superior postocular; 2 nasals, the posterior highest; loreal higher than wide, in contact with second and third labials; preocular single, very high, not in contact with frontal; supraocular twice as long as wide; 3 postoculars; temporals  $\frac{2}{1}+3$ ; 8 upper labials, third, fourth, and fifth entering eye; seventh, sixth, eighth, fifth, fourth, third, second, first is the order of size of labials; 9 lower labials, 5 touching anterior chin shields, which are shorter and broader than posterior; scales in 17 rows, strongly keeled, except outer row, which

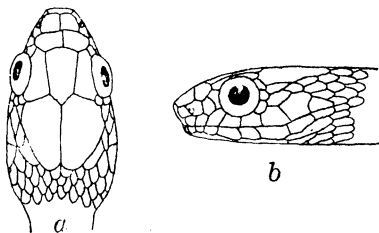


FIG. 7. *Natrix auriculata* (Günther); after Boulenger; a, head, dorsal view; b, head, lateral view.

is only faintly keeled; ventrals, 157; anal double; subcaudals, 72; eye large; body very slender.

*Color in life.*—Above a dark olivaceous gray, with a lighter, median, ashy gray stripe, terminating in a spot of the same color immediately behind the parietal shields; on each side of this line is a series of dim, elongate, dark spots, immediately below which is a series of light, ashy gray spots, followed by another dim series of dark spots below. The markings are not especially distinct; on the outer edge of the ventrals and extending on the first row of scales is a milky white line which widens behind the angle of the jaw; head dark in the parietal region, and somewhat lighter on the snout; throat, lips, and temporal region dull whitish, with small dark spots on the labial sutures and a distinct black spot on the sixth labial; three dark stripes on the belly, the two outer joining the dark parietal area, crossing the angle of the jaw; the median ventral black stripe begins on the twentieth ventral, and continues to the tail; these three lines of black are separated by two white lines formed by continuous series of triangular white spots; only two black stripes under the tail, separated by a single light stripe.

*Measurements of Natrix auriculata (Günther).*

|                | mm. |
|----------------|-----|
| Total length   | 524 |
| Tail           | 145 |
| Width of head  | 10  |
| Length of head | 14  |

*Variation.*—The known range of ventrals and subcaudals is 150 to 158 and 75 to 91, respectively. There is some variation in the arrangement of the temporals. They usually assume the relation of  $\frac{2}{1}+3$ ; the females have a larger average of ventrals and a smaller average of subcaudals than the males. The type is a female having 2 preoculars, 2 postoculars, 152 ventrals, and 76 subcaudals.

*Remarks.*—This species is evidently restricted to the southern Philippines. It is known from Samar, and from eastern and southern Mindanao. All the specimens here recorded are from Agusan River Valley, where it seems to be quite common. It is the smallest species of *Natrix* inhabiting our territory.

The specimens in my collection were all taken in the immediate vicinity of water, usually under leaves or logs at the edge of a small swamp. The species is very well differentiated from all the other Philippine species of *Natrix* by its small size, its large, blunt head, and the markings on the belly.

TABLE 12.—Measurements and scale counts of *Natrix auriculata* (Günther).

| No.  | Locality.                   | Collector.        | Sex or age. | Length. | Tail. | Ventrals. |
|------|-----------------------------|-------------------|-------------|---------|-------|-----------|
|      |                             |                   |             | mm.     | mm.   |           |
| 46   | Bunawan, Agusan.....        | E. H. Taylor..... | yg          | 216     | 68    | 152       |
| 47   | do.....                     | do.....           | yg          | 201     | 87    | 150       |
| 48   | do.....                     | do.....           | ♀           | 465     | 100   | 157       |
| 49   | do.....                     | do.....           | yg          | 257     | 70    | 151       |
| a 50 | do.....                     | do.....           | ♀           | 524     | 145   | 157       |
| 51   | do.....                     | do.....           | yg          | 188     | 55    | 158       |
| 52   | do.....                     | do.....           | ♂           | 344     | 100   | 154       |
| 1726 | do.....                     | do.....           | ♂           | (b)     | (b)   |           |
| 955  | Agusan River, Mindanao..... | J. Merrill.....   | yg          | 140     | 39    | 152       |
| 956  | do.....                     | do.....           | yg          | 180     | 50    | 150       |
| ca   | Philippines.....            | H. Cuming.....    | ♀           |         |       | 152       |

| No.  | Subcaudals. | Anal. | Labials enter eye. | Upper labials. | Lower labials. | Preoculars. | Postoculars. | Scale rows. | Collection.        |
|------|-------------|-------|--------------------|----------------|----------------|-------------|--------------|-------------|--------------------|
| 46   | 83          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | E. H. Taylor.      |
| 47   | 84          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 48   | (b)         | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 49   | 82          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| a 50 | 75          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 51   | 88          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 52   | 87          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 1726 |             | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Bureau of Science. |
| 955  | 82          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| 956  | 84          | 2     | 3, 4, 5            | 8              | 9              | 1           | 3            | 17          | Do.                |
| ca   | 76          | 2     | 3, 4, 5            | 8              |                | 2           | 2            | 17          | British Museum.    |

a Described.

b Mutilated.

c Type.

## NATRIX CREBRIPUNCTATA (Wiegmann)

*Tropidonotus crebripunctatus* WIEGMANN, Nova Acta Ac. Leop.-Carol.17<sup>1</sup> (1835) 250; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 262.*Natrix crebripunctata* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 257.

*Description of species.*—(From Boulenger.) "Head short, very distinct from neck. Eye very large. Rostral broader than deep, just visible from above; internasals as long as broad, as long as the præfrontals; frontal once and three fifths as long as broad, longer than its distance from the end of the snout, as long as the parietals; loreal as long as deep; two præ- and three postoculars; temporals 2 + 3; eight to ten upper labials; (the specimen in the collection has eight on one side, ten on the other), fourth and fifth, fifth or sixth, or sixth and seventh entering the eye; four lower labials in contact with the anterior

chin-shields, which are shorter than the posterior. Scales in 19 rows, all strongly keeled. Ventrals 148-166; anal divided; subcaudals 96-101.

*Color*.—"Olive above, vertebral line lighter and crossed by narrow black bars; upper lip yellowish, the shields black-edged above; belly whitish, with a black dot at the outer end of each shield; posterior ventrals brown on the sides; subcaudals entirely brown."

*Measurements of Natrix crebripunctata (Wiegmann).*

|              | mm. |
|--------------|-----|
| Total length | 680 |
| Tail         | 230 |

*Remarks*.—I have been unable to find this species, and there are no specimens in the collections which I have studied. There is a single specimen in the British Museum collection from the Philippines collected by Cuming. Boettger has placed this species as a synonym of *Natrix spilogaster* (Boie).\*

**NATRIX LINEATA (Peters)**

PLATE 4, FIGS. 6 AND 7; PLATE 5

*Tropidonotus lineatus* PETERS, Mon. Berl. Ak. (1861) 686; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 262; BOETTGER, Ber. Senck. Nat. Ges. (1886) 109.

*Natrix lineata* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 257.

*Description of species*.—(From No. R 34, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, March 15, 1913, by E. H. Taylor.) (Adult male.) Rostral much wider than high, not visible from above; internasals a little longer than wide, bent downward in front to meet rostral, their sutures with surrounding scales subequal; prefrontal a little broader than long, nearly three times the size of internasals, forming its shortest suture with supraocular, its longest suture with its fellow; frontal one-fifth longer than wide, longer than its distance from end of snout, nearly equal in length to width of parietal; parietals large, in contact with 2 postoculars, longer than frontal, but shorter than their distance from end of snout; nasal divided, posterior portion highest; loreal squarish, little more than half as high as posterior nasal; 2 pre-

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\* I strongly suspect that *N. crebripunctata* Wiegmann is indeed *N. spilogaster*. I believe further that Boulenger's species of this name is a distinct species.

oculars (1 on left side), both in contact with loreal; supra-ocular as long as frontal, about half as wide; 3 postoculars; temporals 1 + 2; upper labials 8 (9 on right side), third, fourth, and fifth (fourth, fifth, and sixth on left side) entering eye; seventh, sixth, and fifth largest in the order named; 9 lower labials, 4 in contact with first pair of chin shields (5 in all the other specimens); 2 pairs of chin shields, second longest and narrowest; scales in 19 rows, keeled strongly, except outer row, which is less strongly keeled than the others; ventrals, rounded, 138; anal double; subcaudals, 71; eye moderate, its diameter not equal to its distance from nostril; head narrowed in front, and noticeably broadened in temporal region.

*Color in life.*—Above bluish black, head dark brown with a milk-white stripe from rostral across upper part of labials, continuing backward and downward to where it reaches eighth ventral scale; lower part of upper labials dark; lower labials spotted with dark; chin shields immaculate creamy yellow; belly same color, with a zigzag subcaudal line to end of tail.

*Measurements of Natrix lineata (Peters).*

|              | mm. |
|--------------|-----|
| Total length | 625 |
| Tail         | 159 |

*Variation.*—Table 13 shows the scale counts on a series of specimens collected in the same locality as the type. The variation in the ventral count is from 132 to 142; in the subcaudal count, 64 to 71. The most variable elements are the upper labials and the preoculars; there is a tendency for the third labial to split and in consequence the number of labials entering the orbit varies; 8 is the predominant number of upper labials; 2 is the predominant number of the preoculars.

Markings on the back are evident in the younger specimens. In No. 32 (E. H. Taylor collection) the head is a distinct brown with a broad semicircular dark area on the occipital region followed by a milk-white collar which joins the two labial lines; behind this is a transverse dark olive band, then another lighter olive band, broader than the former, and still another narrow black band, and a second light olive band, after which the dark color breaks up into a network, the limits of the meshes being marked with a larger dark spot. The ground color is light olive brown; this specimen shows a powdering of brown on each ventral, with the subcaudal region very dark.

TABLE 13.—Measurements and scale counts of *Natrix lineata* (Peters).

| No.  | Locality.            |  |  |  |  | Collector.        |  | Sex or age. | Length. | Tail. | Ventrals. | Subcaudals. |
|------|----------------------|--|--|--|--|-------------------|--|-------------|---------|-------|-----------|-------------|
|      |                      |  |  |  |  |                   |  |             | mm.     | mm.   |           |             |
| 29   | Bunawan, Agusan..... |  |  |  |  | E. H. Taylor..... |  | ♂           | 495     | 134   | 132       | 69          |
| 30   | do.....              |  |  |  |  | do.....           |  | ♀           | 574     | (*)   | 137       | (*)         |
| 31   | do.....              |  |  |  |  | do.....           |  | ♂           | 525     | 135   | 136       | 66          |
| 32   | do.....              |  |  |  |  | do.....           |  | yg          | 325     | 58    | 138       | 65          |
| 33   | do.....              |  |  |  |  | do.....           |  | yg          | 391     | 96    | 138       | 64          |
| 34   | do.....              |  |  |  |  | do.....           |  | ♂           | 624     | 159   | 138       | 71          |
| 35   | do.....              |  |  |  |  | do.....           |  | ♀           | 450     | (*)   | 138       | (*)         |
| 36   | do.....              |  |  |  |  | do.....           |  | ♂           | 592     | 140   | 136       | 65          |
| 1714 | do.....              |  |  |  |  | do.....           |  | ♀           |         |       |           |             |
| 1715 | do.....              |  |  |  |  | do.....           |  | ♀           |         |       |           |             |
| 1716 | do.....              |  |  |  |  | do.....           |  | ♂           |         |       |           |             |
| 1717 | do.....              |  |  |  |  | do.....           |  | ♂           |         |       |           |             |
| 1743 | do.....              |  |  |  |  | do.....           |  | yg          |         |       |           |             |
| (b)  | Samar.....           |  |  |  |  | F. Jagor.....     |  |             | 690     | 160   | 142       | 66          |

| No.  | Anal. | Preoculars. | Postoculars. | Upper lab-ials. | Lower lab-ials. | Labials en-ter eye.                                | Temporals. | Labials touch first chin shields. | Scale rows. | Collection.    |  |
|------|-------|-------------|--------------|-----------------|-----------------|--|------------|-----------------------------------|-------------|----------------|--|
| 29   | 2     | 2-1         | 3            | 8               | 10              | 3, 4, 5  | 1+2        | 5                                 | 19          | E. H. Taylor.  |  |
| 30   | 2     | 2           | 3            | 8               | 10              | $\begin{Bmatrix} 4, 5 \\ 3, 4, 5 \end{Bmatrix}$    | 1+2        | 5                                 | 19          | Do.            |  |
| 31   | 2     | 2           | 3            | 8               | 10              | 3, 4, 5  | 1+2        | 5                                 | 19          | Do.            |  |
| 32   | 2     | 2           | 3            | 8               | 10              | 3, 4, 5  | 1+2        | 5                                 | 19          | Do.            |  |
| 33   | 2     | 1           | 3            | 8-9             | 10              | $\begin{Bmatrix} 3, 4, 5 \\ 4, 5, 6 \end{Bmatrix}$ | 1+3        | 5                                 | 19          | Do.            |  |
| 34   | 2     | 1           | 3            | 9-8             | 9               | $\begin{Bmatrix} 3, 4, 5 \\ 4, 5, 6 \end{Bmatrix}$ | 1+2        | 4                                 | 19          | Do.            |  |
| 35   | 2     | 2           | 3            | 9               | 10              | 4, 5, 6  | 1+2        | 5                                 | 19          | Do.            |  |
| 36   | 2     | 1-2         | 3            | 9               | 10              | 4, 5, 6  | 1+2        | 5                                 | 19          | Do.            |  |
| 1714 | 2     | 2           | 3            | 8-9             | 10              | 4, 5   | 1+2        | 5                                 | 19          | Do.            |  |
| 1715 | 2     | 2           | 3            | 8               | 9-10            | 3, 4, 5  | 1+2        | 4                                 | 19          | Do.            |  |
| 1716 | 2     | 2           | 3            | 9               | 10              | 4, 5, 6  | 1+2        | 5                                 | 19          | Do.            |  |
| 1717 | 2     | 2           | 3            | 9               | 9               | 4, 5, 6  | 1+2        | 5                                 | 19          | Do.            |  |
| 1743 | 2     | 2           | 3            | 8               | 9               | 3, 4, 5  | 1+2        | 5                                 | 19          | Do.            |  |
| (b)  | 2     | 2           | 3            | 8               |                 | $\begin{Bmatrix} 4, 5 \\ 3, 4, 5 \end{Bmatrix}$    | 1+2        |                                   | 19          | Berlin Museum. |  |

<sup>a</sup> Mutilated.<sup>b</sup> Type.

*Remarks.*—This species, according to Boulenger,\* is closely allied to *Natrix crebripunctata* (Wiegmann). There is however, but a single anterior temporal in *N. lineata*, which character is constant in the series of thirteen specimens. There is a very much lower average of ventrals and subcaudals. The markings, too, would seem to distinguish it. There are no vertebral lines

\* Cat. Snakes Brit. Mus. 1 (1893) 262.

apparent on the body, even in the young. The widening of the head in the temporal region is very characteristic, especially in older specimens. A female contained five undeveloped eggs. All the specimens were found in damp situations, usually under leaves and trash along the edge of a small swamp. It is common at Bunawan.

#### NATRIX DENDROPHIOPS Günther

This species appears to have two distinct forms in the Philippines, the typical form from Mindanao, and the second, from Negros. They are distinguished as follows:

*Key to the subspecies of Natrix dendrophiops Günther.*

- a*<sup>1</sup>. Scales in 17 rows..... *N. d. dendrophiops* (Günther) (p. 95).  
*a*<sup>2</sup>. Scales in 19 rows..... *N. d. negrosensis* Taylor (p. 97).

#### NATRIX DENDROPHIOPS DENDROPHIOPS (Günther)

*Tropidonotus dendrophiops* GÜNTHER, Ann. & Mag. Nat. Hist. V 11 (1883) 136, fig.; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 264; BOETTGER, Ber. Senck. Nat. Ges. (1886) 109.

?*Tropidonotus hypomelas* MÜLLER, Verh. Nat. Ges. Basel. 1883) 286; III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 15.

*Natrix dendrophiops* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 257.

*Description\* of species.*—(From No. 60, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, September 15, 1913, by E. H. Taylor.) (Adult male.) Rostral large, twice as wide as high, forming its longest suture with nasal, only slightly visible from above; internasals longer than broad, the suture between them equal to prefrontal suture; prefrontals very wide, bending down on sides at a rather sharp angle; frontal longer than its distance from end of snout, not as long as parietals or supraoculars, and not twice as wide as supraoculars, the anterior edge forming nearly a straight line; parietals moderate, longer than broad, in contact with upper postocular and 1 or 2 temporals; scales bordering parietals behind numerous, small; nostrils pierced between 2 nasals, the posterior larger and higher; prefrontals appear to enter nostrils above; loreal not as high as nasals, in contact with both preoculars, its upper edge curving; 2 preoculars, lower in contact with 2 labials, upper separated from frontal; 3 postoculars, upper largest; temporals  $\frac{2}{1} + 3$ ; 9 upper labials, 8 on left side where seventh and eighth are fused into a single scale; fourth, fifth, and sixth enter eye; labials arranged in the following order of size: seventh, ninth, eighth, sixth, fourth, fifth, third, second, first; 10 lower labials, 5 touching chin shields; mental broadly triangular;

second pair of chin shields longer and narrower than first pair, separated throughout their length; scales in 17 rows, all strongly keeled, median rows very small, outer large; ventrals, 154, rounded; anal double; subcaudals divided, 98; eye very large, its diameter nearly equal to its distance from end of snout; body rather slender; tail very slender.

*Color in life.*—Olivaceous above, tinged more or less with pinkish, with three rows of blackish irregular spots, one median dorsal, the other two lateral; these are separated by two rows of pinkish yellow, black-edged spots, continuing full length of body; the black and yellow spots form an irregular transverse row; neck is banded with dark blackish and lighter olivaceous bands; head above brownish gray, lighter on snout, sides of snout brownish yellow; upper labials yellowish with a few spots anteriorly; lower rim of orbit dark; a short black line behind eye; lower labials cream yellow, with spots on edge of sixth; the lateral dark spots extend to ventrals; there are one or two rows of black, elongate spots on ventrals, but these do not form continuous lines; the anterior part of each ventral with numerous small flecks of black; under the last half of belly there is a more or less continuous median dark line to anus; subcaudally almost black; scales narrowly edged with lighter.

*Measurements of Natrix dendrophiops dendrophiops (Günther).*

|                | mm. |
|----------------|-----|
| Total length   | 796 |
| Tail           | 240 |
| Width of head  | 18  |
| Length of head | 24  |

*Variation.*—The ventrals and subcaudals vary between 154 and 157 and 94 and 100, respectively; the postoculars, between 2 and 3, the larger percentage having 3. No. 58 (E. H. Taylor collection) has a single prefrontal on one side only. In the young specimens the markings are more clearly defined. There are a broad blackish bar on the neck and one or two other broad bands behind this. The markings resolve themselves into a large series of narrow, transverse, blackish bands, interrupted laterally by white dots. The type measures 900 millimeters in length and is much larger than any specimen that I have examined.

*Remarks.*—This snake feeds on frogs and is usually found not far from water. Five of the six specimens I collected were taken under logs. Known only from Zamboanga, southwestern Mindanao, and Bunawan in the upper Agusan Valley.

TABLE 14.—Measurements and scale counts of *Natrix dendrophrops dendrophrops* (Günther).

| No.             | Locality.       | Collector.          | Sex or age. | Length. | Tail. | Ventrals. |
|-----------------|-----------------|---------------------|-------------|---------|-------|-----------|
|                 |                 |                     |             | mm.     | mm.   |           |
| 56              | Bunawan, Agusan | E. H. Taylor        | ♂           | 661     | (a)   | 155       |
| 57              | do              | do                  | yg          | 319     | 90    | 154       |
| 58              | do              | do                  | yg          | 360     | (a)   | 156       |
| 59              | do              | do                  |             | 628     | 150   | 155       |
| <sup>b</sup> 60 | do              | do                  | ♂           | 796     | 240   | 154       |
| 1713            | do              | do                  | ♀           | (a)     | (a)   |           |
| <sup>c</sup> a  | Zamboanga       | H. M. S. Challenger | ♀           | 900     | 270   | 157       |

| No.             | Subcaudals. | Anal. | Preoculars. | Postoculars. | Upper labials. | Lower labials. | Labials enter eye. | Scale rows. | Collection.        |
|-----------------|-------------|-------|-------------|--------------|----------------|----------------|--------------------|-------------|--------------------|
| 56              | (a)         | 2     | 2           | 3            | 9              | 9              | 4, 5, 6            | 17          | E. H. Taylor       |
| 57              | 94          | 2     | 2           | 2            | 9              | 10             | 4, 5, 6            | 17          | Do.                |
| 58              | (a)         | 2     | 1-2         | 2            | 10-8           | 10             | 4, 5, 6            | 17          | Do.                |
| 59              | (a)         | 2     | 2           | 3            | 9              | 10             | 4, 5, 6            | 17          | Do.                |
| <sup>b</sup> 60 | 98          | 2     | 2           | 3            | 9-8            | 10             | 4, 5, 6            | 17          | Do.                |
| 1713            |             | 2     | 2           | 3            | 9              | 10             | 4, 5, 6            | 17          | Bureau of Science. |
| <sup>c</sup> a  | 100         | 2     | 1-2         | 3            |                |                | 4, 5, 6            | 17          | British Museum.    |

<sup>a</sup> Mutilated.<sup>b</sup> Described.<sup>c</sup> Type.

## NATRIX DENDROPHIOPS NEGROSENSIS Taylor

*Natrix dendrophrops negrosensis* TAYLOR, Philip. Journ. Sci. § D 12 (1917) 356.

*Description of species.*—(From the type, No. 128, E. H. Taylor collection; collected on Canlaon Volcano, Occidental Negros, by E. H. Taylor.) Rostral fairly large, nearly twice as wide as high. upper edge curved and distinctly visible from above, its sutures with nasals little longer than those with internasals; the latter longer than broad, the suture between them equal to their sutures with prefrontals, which are less than the suture with nasals; prefrontals much broader than long, narrowed on sides, forming coequal sutures with internasal and frontal, their shortest suture with supraocular; frontal longer than broad, wider, but not as long as supraoculars, somewhat shield-shaped, longer than its distance from end of snout, shorter than parietals; the latter longer than broad, bordered laterally by 2 elongate temporals, in contact with only 1 postocular; nostril between 2 nasals, which

differ greatly in shape but are of nearly equal size; loreal nearly square, touching second and third labials; 1 elongate preocular, twice as high as wide, and wider at top than at bottom, semi-divided; 3 small postoculars (4 on right side); temporals  $2 + 3$ ; fourth, fifth, and sixth labials entering eye; mental broadly triangular; 10 lower labials, sixth and seventh largest; first 5 in contact with first chin shield, which is noticeably shorter than second; 19 rows of scales, the outer largest, faintly keeled, all the others strongly keeled; scales with 2 apical pits easily discernible; anal divided; ventrals, 164; subcaudals, 97; eye very large.

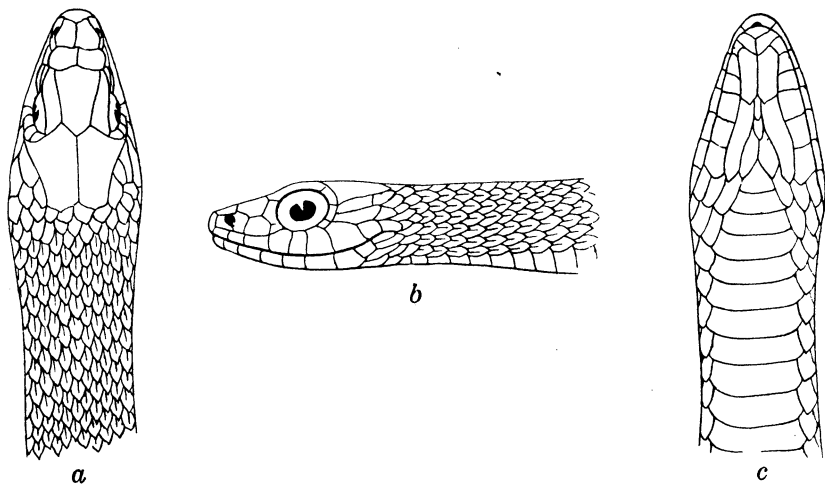


FIG. 8. *Natrix dendrophiops negrosensis* Taylor; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

*Color in life.*—Reddish brown to olive, with a median series of dark, more or less distinct spots or bars at intervals of 0.5 centimeter; on sides and forming continuations of the dark dorsal bars is a series of dark spots. Below pinkish white with a series of small, more or less regular black spots on each ventral and subcaudal; bars on neck very much wider than elsewhere; top of head brownish olive; labials brownish white with dark areas between first three; a distinct black line runs from behind eye to posterior part of eighth supralabial, where it turns and continues downward to first ventrals; scales on head minutely edged with black.

*Measurements of the type of Natrix dendrophrops negrosensis Taylor.*

|                     | mm. |
|---------------------|-----|
| Length              | 730 |
| Snout to vent       | 526 |
| Vent to tip of tail | 204 |
| Width of head       | 11  |
| Length of head      | 20  |
| Diameter of eye     | 5   |

*Variation.*—The postoculars show a tendency to increase to four; one specimen has the third, fourth, and fifth labials entering the eye, and a second specimen shows four labials entering on the right side.

*Remarks.*—The following characteristics seem to warrant the separation of this subspecies from typical *Natrix dendrophrops*. There is a tendency to an increase in the number of postoculars from 3 to 4; there is only a single preocular (specimens of *N. dendrophrops* from northern Mindanao have 2 distinct preoculars); there is an average of 10 more ventrals; there are constantly 19 instead of 17 rows of scales; the eye is somewhat smaller; and the loreal is lower.

**Genus OXYRHABDIUM Boulenger**

- Stenognathus* (non Chaud.) DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 503; JAN, Arch. Zool. Anat. Phys. 2 (1862) 28.  
*Rhabdosoma*, part., GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 10.  
*Geophis*, part., BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.  
*Oxyrhabdium* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 302; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 258.

“Maxillary teeth 30 to 35, small, equal; mandibular teeth equal. Head not distinct from neck; eye small, with vertically subelliptic pupil; nostril pierced between two small nasals; a pair of small internasals; no præocular; loreal and præfrontal entering the eye. Body cylindrical; scales smooth, in 15 rows, without apical pits; ventrals rounded. Tail moderate, subcaudals in two rows. Hypapophyses developed throughout the vertebral column.” (*Boulenger.*)

*Key to the species of Oxyrhabdium Boulenger.*

- a*<sup>1</sup>. Eight upper labials, fifth and sixth entering eye; reddish brown above, yellowish below. Young with yellow collar.  
*O. modestum* (Duméril and Bibron) (p. 100).  
*a*<sup>2</sup>. Seven upper labials, fourth and fifth entering eye; olive green to darker. Young black with dim yellowish rings on body.....  
*O. leporinum.* (Günther) (p. 103).

The genus is confined to the Philippines. The record of Duméril and Bibron for Java is doubtless an error.\* The first species appears to be confined to the southern part of Luzon, Samar, and Mindanao; the second, to northern and central Luzon.

**OXYRHABDIUM MODESTUM (Duméril and Bibron)**

*Stenognathus modestus* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 504; PETERS, Mon. Berl. Ak. (1861) 684; JAN, Arch. Zool. Anat. Phys. 2 (1862) 28; Icon. Gén. (1865) 13, pl. 1, fig. 3.

*Rhabdosoma leporinum*, part., GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 12; F. MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 12.

*Stenognathus modestus*, part., GÜNTHER, Proc. Zool. Soc. London (1873) 169.

*Rhabdosoma modestum*, part., GÜNTHER, Proc. Zool. Soc. London (1879) 77.

*Geophis schadenbergi* FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 93, pl. 3, fig. 4; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106.

*Geophis modestus*, part., BOETTGER, Ber. Senck. Nat. Ges. (1886) 106.

*Oxyrhabdium modestum* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 302; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 258.

*Description of species.*—(From No. 3, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, August 12, 1913, by E. H. Taylor.) (Adult female.) Rostral small, higher than

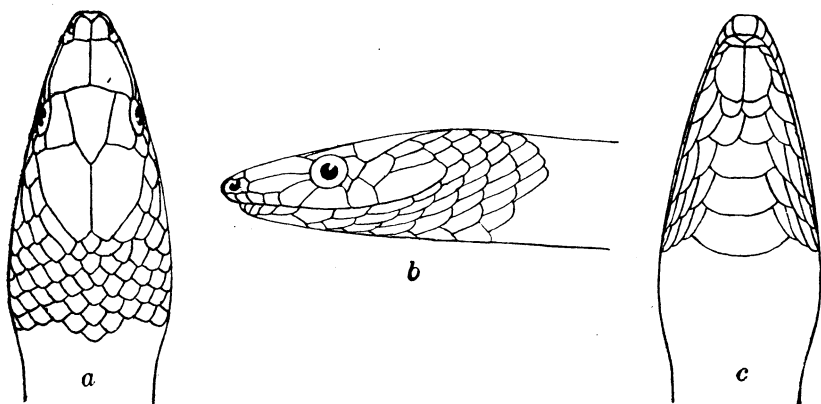


FIG. 9. *Oxyrhabdium modestum* (Duméril and Bibron); drawing of a Mindanao specimen; a, head, dorsal view; b, head, lateral view; c, head, ventral view;  $\times 2$ .

wide, scarcely visible from above; internasals small, the suture between them less than one-third of that between prefrontals; latter very large, equaling or nearly equaling frontal, four or five times the size of internasals, broadly entering eye; frontal nearly twice as long as wide, not twice the width of supra-

\* Günther, Proc. Zool. Soc. London (1873) 169.

oculars; parietals longer than frontal, and twice as long as wide; nostril large, pierced between 2 nasals; loreal three times as long as wide, narrowly entering eye, in contact with 3 labials; no preocular, 2 postoculars; temporals 1 + 2 + 3; 8 upper labials, fifth and sixth entering eye; labials in the following order of size: eighth, sixth, seventh, fifth, fourth, third, second, first; mental narrow, subcrescentic; 6 lower labials, fourth largest, the first 4 in contact with anterior chin shields, which are very broad and closely juxtaposed and followed by 2 small pairs of imbricate scales; mental groove very indistinct; eye small, the diameter less than half the distance from nostril, the pupil appearing nearly round; head somewhat flattened, more or less distinct from neck; snout acuminate; ventrals, 177; anal single; subcaudals, 56; scales in 15 smooth rows, outer largest, all without apical pits; tail cylindrical.

*Color in life.*—Above dark iridescent lavender-brown, becoming lighter on sides; belly immaculate creamy yellow; top of head darker, bluish brown to lavender; labials cream color to yellow; under part of tail a muddy cream, with an indistinct zigzag line between subcaudals; edges of body scales darker, giving the appearance of an indistinct network over body.

*Measurements of Oxyrhabdium modestum (Duméril and Bibron).*

|               | mm. |
|---------------|-----|
| Total length  | 579 |
| Snout to vent | 480 |
| Tail          | 99  |

*Variation.*—It will be seen from Table 15 that males have a smaller number of ventrals and a larger number of subcaudals than females; No. 1 of those listed, although having the average number of ventrals and subcaudals, has only 7 upper labials, with the fourth and fifth entering the eye; in this it agrees with *Oxyrhabdium leporinum*. It has a single postocular, but in all other respects agrees with the other specimens, and in no way resembles *O. leporinum* in color or markings. There is a tendency toward the fusion of the postoculars, and in five specimens they are fused on one or both sides. The young have a yellow collar but no other distinctive markings. I have examined one specimen (No. R 575) from Camp Gandara, Samar, which has the following scale formula: Scale rows, 15; ventrals, 164; anal single; subcaudals, 49; length, 410 millimeters. No. 915 has the anal divided, but otherwise agrees with normal specimens. A single unnumbered specimen in the Santo Tomás Museum, an adult female containing eggs, is the largest one

that was examined, and shows certain variation. Its measurements are: Total length, 602 millimeters; tail, 102. The ventrals number 170, the subcaudals, 54. The loreal fails slightly to enter the eye and is in contact with 4 labials; the internasals are greatly reduced. No locality is given.

TABLE 15.—Measurements and scale counts of *Oxyrhabdium modestum* (Duméril and Bibron).

| No.   | Locality.                 | Collector.          | Sex. | Length. | Tail. |
|-------|---------------------------|---------------------|------|---------|-------|
|       |                           |                     |      | mm.     | mm.   |
| 1     | Bunawan, Agusan .....     | E. H. Taylor .....  | ♀    | 495     | 83    |
| 2     | do .....                  | do .....            | ♀    | 465     | 83    |
| 3     | do .....                  | do .....            | ♀    | 579     | 99    |
| 4     | do .....                  | do .....            | ♀    | 473     | 86    |
| 5     | do .....                  | do .....            | ♀    | 347     | 60    |
| 6     | do .....                  | do .....            | ♀    | 472     | 70    |
| 7     | do .....                  | do .....            | ♂    | 430     | 88    |
| 8     | do .....                  | do .....            | ♂    | 538     | 113   |
| 9     | do .....                  | do .....            | ♀    | 477     | 84    |
| 10    | do .....                  | do .....            | ♀    | 445     | 81    |
| 11    | do .....                  | do .....            | ♂    | 185     | 40    |
| 12    | do .....                  | do .....            | ♀    | 479     | 84    |
| 13    | do .....                  | do .....            | ♂    | 320     | 60    |
| 14    | do .....                  | do .....            | ♂    | 360     | 71    |
| 15    | do .....                  | do .....            | ♀    | 484     | 85    |
| 16    | do .....                  | do .....            | ♀    | 445     | 84    |
| 17    | do .....                  | do .....            | ♂    | 383     | 83    |
| R 575 | Camp Gandara, Samar ..... | Capt. Correll ..... | ♀    | 410     | 67    |
| R 915 | Agusan, Mindanao .....    | E. H. Taylor .....  | ♀    | 480     | 85    |

| No.   | Ventrals. | Subcaudals. | Labials. | Postoculars. | Scale rows. | Labials enter eye. | Collection.        |
|-------|-----------|-------------|----------|--------------|-------------|--------------------|--------------------|
| 1     | 176       | 57          | 7        | 2            | 15          | 4, 5               | E. H. Taylor.      |
| 2     | 172       | 55          | 8        | 2-1          | 15          | 5, 6               | Do.                |
| 3     | 177       | 56          | 8        | 2            | 15          | 5, 6               | Do.                |
| 4     | 166       | 56          | 8        | 1-2          | 15          | 5, 6               | Do.                |
| 5     | 176       | 58          | 8        | 2            | 15          | 5, 6               | Do.                |
| 6     | 179       | 53          | 7-8      | 2-1          | 15          | 4, 5; 5, 6         | Do.                |
| 7     | 169       | 60          | 8        | 2            | 15          | 5, 6               | Do.                |
| 8     | 171       | 66          | 8        | 2            | 15          | 5, 6               | Do.                |
| 9     | 173       | 56          | 8        | 1            | 15          | 5, 6               | Do.                |
| 10    | 175       | 57          | 8        | 2            | 15          | 5, 6               | Do.                |
| 11    | 177       | 63          | 8        | 2            | 15          | 5, 6               | Do.                |
| 12    | 176       | 57          | 8        | 2            | 15          | 5, 6               | Do.                |
| 13    | 162       | 60          | 8        | 2            | 15          | 5, 6               | Do.                |
| 14    | 168       | 63          | 8        | 2            | 15          | 5, 6               | Do.                |
| 15    | 174       | 53          | 8        | 2            | 15          | 5, 6               | Do.                |
| 16    | 176       | 60          | 8        | 2            | 15          | 5, 6               | Do.                |
| 17    | 168       | 62          | 8        | 2            | 15          | 5, 6               | Do.                |
| R 575 | 164       | 49          | 8        | 2            | 15          | 5, 6               | Bureau of Science. |
| R 915 | 173       | 52          | 8        | 2            | 15          | 5, 6               | Do.                |

*Remarks.*—This species has been found only in the Philippine Islands; the known localities \* are Samar, Mindanao, and Dinagat. It was especially common at Bunawan; more than fifty specimens were captured during my collecting there. A few were found burrowed in the roots of large tree ferns (*Asplenium nidus*) but only those in fallen trees. Usually specimens were found in the forest, under grass and leaves on the ground. These snakes are very gentle; although I have handled many living specimens, none has ever attempted to bite. They readily take food in captivity. The Manobos who are familiar with this snake appear to have no specific name for it. They do not regard it as poisonous.

#### OXYRHABDIUM LEPORINUM (Günther)

*Rhabdosoma leporinum*, part., GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 12.

?*Stenognathus brevirostris* PETERS, Mon. Berl. Ak. (1872) 586.

*Stenognathus modestus*, part., GÜNTHER, Proc. Zool. Soc. London (1873) 169.

*Rhabdosoma modestum*, part., GÜNTHER, Proc. Zool. Soc. London (1879) 77.

?*Geophis brevirostris* BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.

*Oxyrhabdium leporinum* BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 303; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 258.

*Description of species.*—(From No. 111, E. H. Taylor collection; collected at Baguio, Benguet, Luzon, June 1, 1915, on the slopes of Mount Santo Tomás at an elevation of about 2,000 meters, by E. H. Taylor.) (Adult female.) Head obtusely

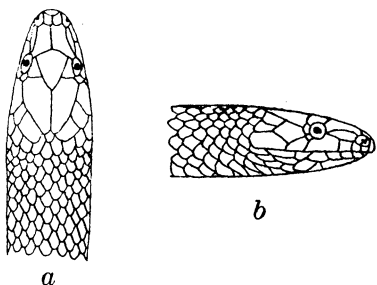


FIG. 10. *Oxyrhabdium leporinum* (Günther); after Boulenger; a, head, dorsal view; b, head, lateral view.

pointed, with a very small rostral, little higher than wide, barely visible from above; internasals small, the suture between them one-third to one-fourth that of prefrontals; latter large, rather narrow, five to six times the size of internasals, and nearly equal to frontal, broadly entering eye and forming its longest suture with loreal, which is a little longer than that formed

between the 2 prefrontals; frontal but little longer than wide,

\* Günther lists Luzon as a known locality, but since he confused the two species it is not improbable that he referred to *O. leporinum*.

nearly three times as wide as supraoculars; parietals large, not twice as long as frontal; nostril between 2 nasals, the posterior largest; loreal about five times as long as wide, narrowly entering eye; supraocular narrow, elongate; 2 small postoculars, upper largest; temporals 1 + 2; 7 labials, fourth and fifth entering eye; seventh, fourth, fifth, sixth, third, second, first, is the order of size of the labials; mental very small, subcrescentic; chin shields very large, closely juxtaposed with a very indistinct mental groove; chin shields followed by 3 pairs of imbricate scales; eye dark blue, with a yellow vertical pupil; head distinct from neck; ventrals, 165; anal undivided; subcaudals, 41; scale rows, 15, all smooth.

*Color in life.*—A bright uniform yellow-olive, iridescent above; head same color but a little darker; labials yellowish, spotted with brown; below yellow-cream, edges of ventrals tinged with grayish; dark subcaudally. In alcohol the color changes to a dull brownish black.

*Measurements of Oxyrhabdium leporinum (Günther).*

|               | mm. |
|---------------|-----|
| Total length  | 685 |
| Snout to vent | 592 |
| Tail          | 93  |
| Head width    | 12  |
| Head length   | 25  |

*Variation.*—There are one adult and three young specimens in my collection from Benguet. There is one adult specimen in the Bureau of Science collection. There is but little variation evident in the species, save in the ventral and subcaudal counts, the limits in the former being 164 and 180, and in the latter, 41 and 51. The young are a slaty blue-black, with a whitish nuchal collar and a series of indistinct bands of white 1 or 2 scales wide crossing the body in a zigzag manner.

*Remarks.*—This species seems to be confined to the highlands of Luzon; it is a rare snake. Two specimens were dug up along an irrigation ditch, and a third had burrowed under a rock at an elevation of 2,000 meters on Mount Santo Tomas. The specimen here described was found crawling in an open forest path. This species is of a very gentle disposition. The type was collected by H. Cuming; the exact type locality is no longer known. A second specimen in the British Museum is from Luzon, collected by A. B. Meyer. The types of *Stenognathus*

*brevirostris* Peters, a young and an old specimen, are from "Philippines," collected by Wallis.\*

TABLE 16.—Measurements and scale counts of *Oxyrhabdium leporinum* (Günther).

| No.    | Locality.                       |  | Collector.        |  | Sex or age. | Length. |
|--------|---------------------------------|--|-------------------|--|-------------|---------|
|        |                                 |  |                   |  |             | mm.     |
| 111    | Mount Santo Tomas, Benguet..... |  | E. H. Taylor..... |  |             | 685     |
| 112    | do .....                        |  | do .....          |  | yg          | 272     |
| 113    | Baguio .....                    |  | do .....          |  | yg (a)      |         |
| 114    | do .....                        |  | do .....          |  | yg          | 282     |
| R 1710 | do .....                        |  | do .....          |  | ♀           | 657     |
| (a)    | Philippines.....                |  | H. Cuming.....    |  |             | 820     |
| (b)    | Luzon .....                     |  | A. B. Meyer.....  |  |             |         |
| (c)    | Philippines.....                |  | Wallis .....      |  |             | 635     |

| No.    | Tail. | Ventrals. | Subcaudals. | Labials. | Postoculars. | Scale rows. | Labials enter eye. | Collection.        |
|--------|-------|-----------|-------------|----------|--------------|-------------|--------------------|--------------------|
|        | mm.   |           |             |          |              |             |                    |                    |
| 111    | 93    | 165       | 41          | 7        | 2            | 15          | 4, 5               | E. H. Taylor.      |
| 112    | 45    | 164       | 44          | 7        | 2            | 15          | 4, 5               | Do.                |
| 113    | (a)   |           |             | 7        | 2            | 15          | 4, 5               | Do.                |
| 114    | 44    | 174       | 46          | 7        | 2            | 15          | 4, 6               | Do.                |
| R 1710 | 94    | 174       | 38          | 7        | 2            | 15          | 4, 5               | Bureau of Science. |
| (a)    | 105   | 169       | 43          | 7        |              | 15          | 4, 5               | British Museum.    |
| (b)    |       | 180       | 45          | 7        |              | 15          | 4, 5               | Do.                |
| (c)    | 108   | 175       | 51          | 7        |              | 15          | 4, 5               | Berlin.            |

<sup>a</sup> Badly mutilated.

<sup>b</sup> Type; counts from Boulenger, loc. cit.

<sup>c</sup> Type of *Stenognathus brevirostris* Peters; from Peters.

### Genus CYCLOCORUS Duméril and Bibron

*Lycodon*, part., REINHARDT, Kongl. Danske Vid. Selsk. Afhandl. 10 (1843) 241.

*Cyclocorus* DUMÉRIL and BIBRON, Mém. Ac. Sci. 23 (1853) 460; Erp. Gén. 7 (1854) 385; GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 208; JAN, Elenco Sist. Ofid. (1863) 95; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 326; BOETTGER, Ber. Senck. Nat. Ges. (1886) 114.

"Maxillary and dentary bones angularly bent inwards anteriorly; three or four anterior teeth, in both jaws, increasing in size, the last large and fang-like, followed after an interspace by 12 or 13 small maxillary teeth. Head slightly distinct from

\* May represent a distinct species.

neck; eye rather small, with round pupil. Body moderately elongate, cylindrical; scales smooth, with apical pits, in 17 rows; ventrals rounded. Tail moderate; subcaudals single. Hypapophyses developed throughout the vertebral column." (*Boulenger*.)

This is a Philippine genus having only a single known species, *Cyclocorus lineatus* (Reinhardt). This species is rather inconspicuous; it attains a length of about half a meter.

**CYCLOCORUS LINEATUS (Reinhardt)**

*Lycodon lineatus* REINHARDT, Kongl. Danske Vid. Selsk. Afhandl. 10 (1843) 241, pl. 1, figs. 7-9.

*Cyclocorus lineatus* DUMÉRIl and BIBRON, Erp. Gén. 7 (1854) 386; GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 208; PETERS, Mon. Berl. Ak. (1861) 688; JAN, Icon. Gén. (1870) part 36, pl. 6, fig. 2; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 17; BOETTGER, Ber. Senck. Nat. Ges. (1886) 114; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 327; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 438; GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 211; § D 6 (1911) 258; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359; § D 13 (1918) 260.

*Description of species*.—(From No. 144, E. H. Taylor collection; collected on Canlaon Volcano, Occidental Negros, December 27, 1914, elevation about 900 meters, by E. H. Taylor.) (Adult male.) Rostral twice as wide as high, slightly visible from above; internasals small, less than half as large as prefrontals, more or less rectangular in shape; prefrontal forming its largest sutures with frontal; supraocular and loreal sutures smallest; frontal chevron-shaped, more than twice as long as wide, longer than its distance from end of snout; parietals large, not as long as frontal and prefrontals together, but longer than the former; supraocular not twice as long as wide; nostril between 2 nasals, anterior largest and nearly surrounding nostril; posterior nasal moderate, with a depression on its surface; loreal small, pentagonal, forming its longest suture with second labial; 2 preoculars, superior more than twice as large as inferior; 2 subequal postoculars; temporals 2 + 2 + 2, third superior being much the largest; 8 upper labials, third to fifth entering eye; seventh, eighth, fifth, and sixth largest, in the order named; 8 lower labials, fourth largest, last 2 small; mental an equilateral triangle; 4 labials in contact with anterior chin shields, which are nearly equal in length to posterior pair; latter pair separated from ventrals by 2 rows of small scales; ventrals, 146; anal single; subcaudals, 52; scales in 17 rows, all smooth with apical pits.

*Color in life.*—Bluish brown above with three darker lines beginning near the head and continuing to end of tail; these are scarcely visible anteriorly; each line incloses a series of small, dim, whitish yellow dots; ventrals with a heavy brownish line, extending the length of body; a small whitish dot on end of each ventral, but not continuing on subcaudals; scattered triangular black spots on ventrals; head markings more or less indistinct, regular; labials lighter with a dull stripe below eye, the lighter part edged with darker; chin and throat dark with cream yellow spots; lower labials with distinct yellow spots.

*Measurements of Cyclocorus lineatus (Reinhardt).*

|                |     |
|----------------|-----|
|                | mm. |
| Total length   | 440 |
| Snout to vent  | 341 |
| Tail           | 99  |
| Width of head  | 13  |
| Length of head | 21  |

*Variation.*—There is much variation in certain scale elements in this species and it appears to be associated with geographical distribution. The Mindanao forms vary uniformly in scale count from Negros or Luzon specimens, and might be regarded as worthy of subspecific rank. Specimens from Samar and Leyte or southern Luzon would probably connect the various forms. Table 17 shows the differences that exist between the southern and the northern groups. There is a marked difference between the tail length of the Mindanao and the tail length of the northern specimens, especially in the males, the average being about 16 millimeters. The Mindanao specimens average

TABLE 17.—Average measurements and scale counts of *Cyclocorus lineatus* (Reinhardt).

| Locality.                     | Number and sex.                 | Average. |       |           |             |
|-------------------------------|---------------------------------|----------|-------|-----------|-------------|
|                               |                                 | Length.  | Tail. | Ventrals. | Subcaudals. |
|                               |                                 | mm.      | mm.   |           |             |
| Mindanao.....                 | 12 males of nearly equal size.  | 440      | 121   | -----     | -----       |
| Various northern localities.. | 14 males of nearly equal size.  | 438      | 105   | -----     | -----       |
| Mindanao.....                 | 8 females of nearly equal size. | 460      | 91    | -----     | -----       |
| Various northern localities.. | 6 females of nearly equal size. | 480      | 93    | -----     | -----       |
| Mindanao.....                 | 18 males                        | -----    | ----- | 130       | 54          |
| Do.....                       | 13 females                      | -----    | ----- | 142       | 47          |
| Various northern localities.. | 16 males                        | -----    | ----- | 145       | 52          |
| Do.....                       | 18 females                      | -----    | ----- | 150       | 44          |

15 ventrals less for the males, and 8 ventrals less for the females, while the number of subcaudals in the Mindanao forms is higher in both cases. The range of ventrals for the species is 128 to 157; of subcaudals, 37 to 59. The temporal scales in the Mindanao specimens are normally 1 + 2. Of thirty-one specimens examined twenty-four had the normal arrangement; five had the number on one side only, and two had 2 + 2, which is the normal formula in the northern specimens. The loreal in northern forms is constantly larger, as is the superior preocular which extends well above the loreal; the number of lower labials touching the anterior chin shields averages one less in Mindanao specimens. The same variations of color are found in both groups.

The color in young specimens varies considerably from that in the adult. The median dark stripe is distinct, going forward to between the eyes where the interorbital bar intersects it; another bar of dark brown crosses it in the occipital region; on

TABLE 18.—Measurements and scale counts of *Cyclocorus lineatus* (Reinhardt).

| No.  | Locality.               | Collector.                   | Sex. | Length. | Tail. |
|------|-------------------------|------------------------------|------|---------|-------|
|      |                         |                              |      | mm.     | mm.   |
| 70   | Bunawan, Agusan         | E. H. Taylor                 | ♂    | 376     | 105   |
| 71   | do                      | do                           | ♂    | 418     | 123   |
| 72   | do                      | do                           | ♂    | 423     | 102   |
| 73   | do                      | do                           | ♀    | 277     | 58    |
| 74   | do                      | do                           | ♀    | 384     | 79    |
| 75   | do                      | do                           | ♂    | 427     | 117   |
| 76   | do                      | do                           | ♂    | 368     | (*)   |
| 77   | do                      | do                           | ♀    | 365     | 88    |
| 143  | Canlaon Volcano, Negros | do                           | ♂    | 433     | 101   |
| 144  | do                      | do                           | ♂    | 440     | 99    |
| 145  | do                      | do                           | ♀    | 368     | 82    |
| 147  | do                      | do                           | ♀    | 363     | 60    |
| 149  | do                      | do                           | ♀    | 425     | 70    |
| 151  | do                      | do                           | ♂    | 396     | 90    |
| 153  | do                      | do                           | ♂    | 427     | 96    |
| 155  | do                      | do                           | ♀    | 338     | 74    |
| 158  | do                      | do                           | ♀    | 385     | 79    |
| 159  | do                      | do                           | ♀    | 372     | 79    |
| 810  | Polillo                 | C. Canonizado                | ♀    | 525     | 101   |
| 809  | do                      | do                           | ♀    | 440     | 85    |
| 1483 | Puerto Galera, Mindoro  | Marine Biological Expedition | ♀    | 471     | 92    |
| 323  | Sumagui, Mindoro        | Clark Burks                  | ♂    | 360     | (*)   |
| 324  | do                      | do                           | ♂    | 420     | 114   |
| 325  | do                      | do                           | ♂    | 465     | 112   |

\* Mutilated.

TABLE 18.—*Measurements and scale counts of Cyclocorus lineatus (Reinhardt)*—Continued.

| No.  | Ventrals. | Subcaudals. | Anal. | Preoculars. | Postoculars. | Upper labials. | Labials enter eye. | Labials touch chin shields. | Scale rows. | Temporals. | Collection.        |
|------|-----------|-------------|-------|-------------|--------------|----------------|--------------------|-----------------------------|-------------|------------|--------------------|
| 70   | 132       | 58          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | E. H. Taylor.      |
| 71   | 128       | 57          | 1     | 2           | 2            | 8              | 3, 4, 5            | 3                           | 17          | 1+2        | Do.                |
| 72   | 131       | 46          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 1+2        | Do.                |
| 73   | 139       | 47          | 1     | 2           | 2            | 8              | 3, 4, 5            | 3                           | 17          | 1+2        | Do.                |
| 74   | 139       | 45          | 1     | 2           | 2            | 8              | 3, 4, 5            | 3                           | 17          | 1+2        | Do.                |
| 75   | 129       | 56          | 1     | 2           | 2            | 8              | 3, 4, 5            | 3                           | 17          | 1+2        | Do.                |
| 76   | 130       | (a)         | 1     | 2           | 2            | 8              | 3, 4, 5            | 3                           | 17          | 1+2        | Do.                |
| 77   | 147       | 48          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 143  | 146       | 51          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 144  | 146       | 52          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 145  | 143       | 43          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 147  | 157       | 39          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 149  | 151       | 40          | 1     | 2           | 2            | 8              | 3, 4, 5            | 5-5                         | 17          | 2+2        | Do.                |
| 151  | 145       | 49          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4-5                         | 17          | 2+2        | Do.                |
| 153  | 145       | 51          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 155  | 149       | 52          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 158  | 154       | 37          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 159  | 146       | 49          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4-5                         | 17          | 1+2<br>2+2 | Do.                |
| 810  | 153       | 47          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4-5                         | 17          | 2+2        | Bureau of Science. |
| 809  | 151       | 44          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 1483 | 149       | 43          | 1     | 2           | 2            | 8              | 3, 4, 5            | 4                           | 17          | 2+2        | Do.                |
| 323  | 143       | (a)         | 1     | 2           | 2            | 8              | 3, 4<br>3, 4, 5    | 4                           | 17          | 2+2        | E. H. Taylor.      |
| 324  | 146       | 59          | 1     | 2           | 2            | 8              | 3, 4, 5            | 5                           | 17          | 2+2        | Do.                |
| 325  | 145       | 53          | 1     | 2           | 2            | 8              | 3, 4, 5            | 5                           | 17          | 2+2        | Do.                |

a Mutilated.

either side of this are broad light lines, bordered below by a row of minute white spots edged with black; below this the color is darker brown; on either side of the ventrals is a row of small whitish dots as well as the large triangular black spots.

*Remarks.*—The species is not rare and is probably found in all the larger islands of the Philippines, with the exception of the Palawan group, where I suspect it is wanting. On Mount Canlaon, Occidental Negros, and in Bunawan, Agusan, Mindanao, it appeared to be very common. Specimens are known from several localities in Mindanao, Negros, and Mindoro and from Luzon, Masbate, and Lubang Islands. The most northern record is Ifugao, Mountain Province, Luzon; the most southern, Zamboanga. The species is confined to the Philippines.

On Canlaon Volcano several of the specimens taken contained remains of small *Pseudorhabdium mcnamarae* or *Calamaria ger-*

*vaisii iridescens*, which they would disgorge when captured. The female lays five or six eggs which are about 2 centimeters long when newly laid. These are placed usually under a log. On one occasion a set of eggs was obtained from the interior of a small ant hill at the base of a tree; when opened the eggs were found to contain embryos almost completely developed.

The snake is small and inconspicuous and in consequence is not readily recognized as distinct by the Filipinos who class it with certain other snakes to which is applied the name *ahas natulog* (sleeping snake); this is scarcely appropriate, as the snake is very active and quick to take offense. The Manobos of Mindanao regard it as the young of the black and yellow cobra, *Naja samarensis*, which they call *haguason*; the Ifugaos of northern Luzon regard it as a deadly snake, and manifest great fear of it. The wound made by the bite is rather painful due to the enlarged front teeth. Needless to say, it has no poison.

The species can be readily recognized by the single row of subcaudals, and the triangular black spots on the belly.

#### HOMALOPSINÆ

Nostrils valvular, on upper surface of snout; dentition well developed; hypapophyses developed throughout vertebral column; grooved fangs in posterior part of mouth. Aquatic snakes, giving birth to their young. More or less poisonous, but not dangerous.

This subfamily is confined to eastern Asia, Malaysia, and the Papua-Australian region. It contains about ten genera, most of which contain only single species. Only *Hurria* and *Fordonia* are positively known to occur in the Philippines. *Gerardia* has been frequently included in Philippine faunal lists on the authority of Duméril and Bibron, who report *Gerardia prevostiana* Eydoux and Gervais from Manila. The specimen so reported very probably originated in Ceylon, or on the Indian coast.

#### *Key to the Philippine genera of the Homalopsinæ.*

- $\alpha^1$ . Nasals in contact; scales keeled..... *Hurria* Daudin (p. 110).  
 $\alpha^2$ . Nasals separated by an internasal; scales smooth.

*Fordonia* Gray (p. 115).

#### Genus *HURRIA* Daudin

*Hydrus*, part., SCHNEIDER, Syst. Amph. 1 (1799) 233.

*Hurria* DAUDIN, Bull. Soc. Philom. Paris 3 (1803) 187; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 304.

*Hurria* FISCHER, Zoognosia ed. 3, 1 (1813) 65.

*Hurrianus* RAFINESQUE, Anal. Nat. (1815) 77.

*Strephon* GOLDFUSZ, Handb. Zool. 2 (1820) 151.

*Cerberus* CUVIER, Reg. Anim. 2d ed. 2 (1829) 81; GRAY, Zool. Misc. (1842) 64; Cat. Vip. Snakes (1849) 63; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 977; GÜNTHER, Rept. Brit. India (1864) 278; BOULENGER, Fauna Brit. India, Rept. (1890) 374; Cat. Snakes Brit. Mus. 3 (1896) 15; BOETTGER, Ber. Senck. Nat. Ges. (1886) 110; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 431.

"Maxillary teeth 12 to 17, followed, after a very short interspace, by two slightly enlarged, grooved teeth; anterior mandibular teeth longest. Head small, not very distinct from neck; eye small, with vertically elliptic pupil; snout covered with shields; parietal shields more or less broken up into scales; nasals in contact behind the rostral, semidivided, the cleft extending from the nostril to the first or second labial; two internasals (rarely united); loreal present. Body cylindrical; scales striated and keeled, without pits, in 23 to 29 rows; ventrals rounded. Tail moderate, slightly compressed; subcaudals in two rows." (*Boulenger.*)

Two species are found in the Philippines, the widely distributed *Hurria rynchops* (Schneider) and the rare *Hurria microlepis* (Boulenger); the latter appears to be confined to the Philippines.

*Key to the Philippine species of Hurria Daudin.*

a<sup>1</sup>. Four lower labials touching first chin shields; scales in 23 to 27 rows; strongly keeled; ventrals, 132 to 160.

*H. rynchops* (Schneider) (p. 111).

a<sup>2</sup>. Three lower labials touching first chin shields; scales in 29 rows, feebly keeled; ventrals, 163 to 165. *H. microlepis* (Boulenger) (p. 114)

These snakes are more aquatic than terrestrial in habits. They are somewhat poisonous, but certainly not deadly poisonous to man.

#### HURRIA RYNCHOPS (Schneider)

*Hydrus rynchops* SCHNEIDER, Hist. Amph. 1 (1799) 246.

*Elaps boæformis* SCHNEIDER, Hist. Amph. 2 (1801) 301.

*Hydrus cinereus* SHAW, Gen. Zool. 3 (1802) 567.

*Hurria schneideriana* DAUDIN, Nat. Hist. Rept. 5 (1803) 281.

*Hurria bilineata* DAUDIN, Nat. Hist. Rept. 5 (1803) 284.

*Coluber cerebus* DAUDIN, Nat. Hist. Rept. 7 (1803) 167.

*Homalopsis cerberus* FITZINGER, Neue Class. Rept. (1826) 55.

*Python elapiformis* MERREM, Tent. Syst. Amph. (1820) 89.

*Python rhynchops* MERREM, Tent. Syst. Amph. (1820) 90.

*Cerberus rhynchops* GÜNTHER, Rept. Brit. India (1864) 279; Proc.

Zool. Soc. London (1879) 78; BOULENGER, Fauna Brit. India, Rept.

(1890) 374; Cat. Snakes Brit. Mus. 3 (1896) 16; BOETTGER, Ber.

Senck. Nat. Ges. (1886) 110.

- Cerberus cinereus* CANTOR, Proc. Zool. Soc. London (1839) 54;  
 GRAY, Cat. Vip. Snakes (1849) 64.  
*Cerberus acutus* GRAY, Cat. Vip. Snakes (1849) 65.  
*Cerberus unicolor* GRAY, Cat. Vip. Snakes (1849) 65.  
*Cerberus boæformis* PETERS, Mon. Berl. Ak. (1861) 687.  
*Homalopsis boæformis* JAN, Elenco Sist. Ofid. (1863) 77.  
*Hurria rynchops* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 304.  
*Hurria rynchops* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 599;  
 § D 5 (1910) 213; § D 6 (1911) 263; TAYLOR, Philip. Journ. Sci.  
 § D 12 (1917) 364.

*Description of species.*—(From No. 663, E. H. Taylor collection; collected at Hinigaran, Occidental Negros, February 19, 1914, by E. H. Taylor.) (Adult female.) Rostral pentagonal, wider than high; a pair of large, irregular nasals immediately behind rostral and separating it from internasals; nostrils half-moon-shaped provided with valves, situated near back part of nasal scales, with a small suture running down to edge of each scale and partly dividing it; 2 small triangular internasals, somewhat unequal, followed by prefrontals, latter twice the size of internasals; frontal broken into 2 large and several small scales; parietals broken into numerous small scales; preocular elongate and fused below eye with second postocular, separating labials from eye; loreal lozenge-shaped, touching internasal; temporals not distinguishable from parietals or body scales; 11 supralabials, vertically elongate, seventh, eighth, and sixth largest in the order named, first very much elongate, separating second labial from nasal; on the right side first labial is broken into two parts; above last 3 labials is a much enlarged scale; mental narrow, triangular; 12 lower labials, seventh, sixth, and fifth largest in the order named; last lower labials are very small and scarcely differentiated; 4 labials touching first pair of chin shields; second pair of chin shields almost entirely between first pair and labials; 25 scale rows, all strongly keeled except the 3 outer; ventrals, 156; anal divided; subcaudals, 66 pairs; head slender, with neck slightly constricted; body short and thick, more than twice as wide as head in its widest part; all the scales show very fine but distinct striations; scales on head imbricate.

*Color in life.*—Above drab to ashy gray, with about fifty narrow, irregular, broken bars across body, not reaching ventrals laterally; an indistinct light stripe running from snout across upper labials, following the three outer scale rows, and not crossed by dark bars; lower and upper labials with dusky spots; dark stripe begins behind eye and continues to some distance

on neck; a narrow three-armed spot on occipital region; throat dirty whitish; anterior part of ventral surface mottled with large, irregular mottlings, which grow more numerous through middle and back part of body; ventral surface of caudal region almost black; head dark, similar to body.

*Measurements of Hurria rynchops (Schneider).*

|               | mm. |
|---------------|-----|
| Total length  | 670 |
| Snout to vent | 525 |
| Tail          | 145 |

*Variation.*—Stejneger gives the following limits of variation in scale counts: Scale rows, 23 to 27; ventrals, 132 to 160; subcaudals, 49 to 72. In thirty-three specimens I examined the ventrals range from 140 to 165, the average being 157. In four specimens there are more than 160, in two, less than 150. Subcaudals range from 51 to 68, the average being 58. Scale rows around body vary between 23 and 27; only one specimen, the largest examined, has 27 rows. The posterior labial in all the specimens is small and scarcely distinguishable; frequently the anterior upper labials are broken across the top, while the posterior upper labials are broken across the bottom.

The specimens vary considerably in markings, some being dull lead color with dim darker marblings, while others are light brown with distinct spots or bars. The markings in the young are distinct.

TABLE 19.—*Measurements and scale counts of Hurria rynchops (Schneider.)*

| No. | Locality. | Collector.    | Sex. | Length. | Tail. | Ventrals. | Subcaudals. |
|-----|-----------|---------------|------|---------|-------|-----------|-------------|
|     |           |               |      | mm.     | mm.   |           |             |
| 502 | Bantayan  | L. E. Griffin | ♀    | 855     | 135   | 156       | 60          |
| 506 | do        | do            | ♂    | 735     | 138   | 162       | 60          |
| 507 | do        | do            | ♂    | 730     | 145   | 160       | 58          |
| 509 | do        | do            | ♀    | 770     | 135   | 151       | 54          |
| 510 | do        | do            | ♂    | 785     | 157   | 160       | 58          |
| 512 | do        | do            | ♂    | 815     | 152   | 165       | 58          |
| 515 | do        | do            | ♂    | 782     | 158   | 159       | 60          |
| 518 | do        | do            | ♂    | 670     | 130   | 158       | 59          |
| 520 | do        | do            | ♂    | 750     | 165   | 155       | 68          |
| 521 | do        | do            | ♂    | 630     | 120   | 159       | 59          |
| 522 | do        | do            | ♀    | 790     | 130   | 159       | 51          |
| 523 | do        | do            | ♂    | 695     | 138   | 163       | 60          |
| 529 | do        | do            | ♂    | 715     | 120   | 154       | *51         |
| 530 | do        | do            | ♂    | 745     | 152   | 158       | 61          |
|     | Manila    | M. Ligaya     | ♀    | 960     | 170   | 150       | 56          |

\* Mutilated.

TABLE 19.—*Measurements and scale counts of Hurria rynchops (Schneider)*—Continued.

| No.   | Scale rows. | Labials. |        |                           | Loreal touches internasal. | Collection.        |
|-------|-------------|----------|--------|---------------------------|----------------------------|--------------------|
|       |             | Upper.   | Lower. | Touch first chin shields. |                            |                    |
| 502   | 24          | 11       | 13     | 4                         | Yes .....                  | Bureau of Science. |
| 506   | 23          | 11       | 14     | 4                         | do .....                   | Do.                |
| 507   | 23          | 10       | 13     | 4                         | do .....                   | Do.                |
| 509   | 25          | 11       | 14     | 4                         | do .....                   | Do.                |
| 510   | 23          | 10-11    | 13     | 4-5                       | do .....                   | Do.                |
| 512   | 23          | 11       | 13     | 4                         | do .....                   | Do.                |
| 515   | 24          | 11-10    | 13     | 4                         | Barely .....               | Do.                |
| 518   | 23          | 10-11    | 11-12  | 4                         | Yes .....                  | Do.                |
| 520   | 23          | 9-11     | 13     | 4                         | do .....                   | Do.                |
| 521   | 24          | 11       | 13     | 4                         | do .....                   | Do.                |
| 522   | 23          | 11       | -----  | 4                         | Barely .....               | Do.                |
| 523   | 23          | 10       | 12     | 4                         | Yes .....                  | Do.                |
| 529   | 25          | 11       | 13     | 4                         | On one side .....          | Do.                |
| 530   | 23          | 11       | 12     | 4                         | Yes .....                  | Do.                |
| ----- | 27          | 13-12    | 14-14  | b 4-2                     | Barely .....               | Do.                |

b Injured.

*Remarks.*—This widely distributed snake is found from India to the Pelew Islands, occurring in Ceylon, Malay Peninsula, the East Indies, and the Moluccas. In the Philippines it has been reported from Luzon, Mindanao, Palawan, Negros, Bantayan, Cuyo, and Polillo.

## HURRIA MICROLEPIS (Boulenger)

PLATE 6, FIGS. 1 TO 3

*Cerberus cinereus*, part., GRAY, Cat. Vip. Snakes (1849) 64.

*Cerberus microlepis* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 18, pl. 2, fig. 2.

*Description of species.*—(From Boulenger.) “Closely allied to [*Cerberus*] *rhynchops*, but only three (exceptionally four) lower labials in contact with the anterior chin-shields; loreal not touching the internasal; scales much smaller, in 29 rows, rather feebly keeled; and ventrals more numerous, 163–165. Dark olive above, with darker spots; a dark streak on each side of the head, passing through the eye; yellowish beneath, much spotted or marbled with blackish.

“Total length 660 millim.; tail 120.”

*Remarks.*—The types were collected by H. Cuming; the exact localities are no longer known. Griffin reports a specimen of this species from Camiguin, Babuyan Islands. As the specimen

consists of only a head I am uncertain whether the identification is correct. Only three lower labials touch the first chin shields.

Genus **FORDONIA** Gray

*Homalopsis*, part., SCHLEGEL, Phys. Serp. 2 (1837) 332.

*Fordonia* GRAY, Zool. Misc. (1842) 67; Cat. Vip. Snakes (1849) 76; GÜNTHER, Rept. Brit. India (1864) 277; BOULENGER, Fauna Brit. India, Rept. (1890) 378; Cat. Snakes Brit. Mus. 3 (1896) 21.

*Hemiodontus* DUMÉRIL and BIBRON, Mém. Ac. Sci. 23 (1853) 494; Erp. Gén. 7 (1854) 882.

*Hemiodontus*, part., JAN, Arch. Zool. Anat. Phys. 3 (1865) 263.

Maxillary teeth small, 7 or 8, followed by 2 enlarged grooved teeth. Mandibular teeth subequal. Head depressed, short, broad, scarcely distinct from neck; body stout, cylindrical; tail short. Eye very small, pupil vertical; upper surface of head with large shields; nostril pointing up in a single nasal; an internasal separating nasals, no loreal; 5 upper labials; body cylindrical, scales smooth without apical pits; ventrals rounded; tail short; subcaudals all or part in 2 rows.

**FORDONIA LEUCOBALIA** (Schlegel)

*Homalopsis leucobalia* SCHLEGEL, Phys. Serp. 2 (1837) 345, pl. 13, figs. 8 and 9; SCHLEGEL and MÜLLER, Verh. Nat. Nederl. Overz. Bezitt., Rept. (1844) 61, pl. 8; CANTOR, Cat. Mal. Rept. (1847) 102, pl. 40, fig. 5 var.

*Fordonia leucobalia* GRAY, Zool. Misc. (1842) 67; Cat. Vip. Snakes (1849) 77; BOULENGER, Fauna Brit. India, Rept. (1890) 378; SCLATER, Journ. As. Soc. Bengal 60 (1891) 245; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 21.

*Fordonia unicolor* GRAY, Cat. Vip. Snakes (1849) 77; GÜNTHER, Rept. Brit. India (1864) 277; Zool. Rec. (1865) 154; THEOBALD, Cat. Rept. Brit. India (1876) 182; PETERS and DORIA, Ann. Mus. Genova 13 (1878) 389; BOETTGER, Ber. Senck. Nat. Ges. (1892) 26 (Philippines).

*Hemiodontus leucobalia* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 884; JAN, Arch. Zool. Anat. Phys. 3 (1865) 264; Icon. Gén. (1868) 28, pl. 6, fig. 1.

*Hemiodontus chalybæus* JAN, Elenco Sist. Ofid. (1863) 79.

*Fordonia bicolor* THEOBALD, Journ. Linn. Soc. 10 (1868) 56; Cat. Rept. Brit. India (1876) 181.

*Fordonia variabilis* MACLEAY, Proc. Linn. Soc. N. S. W. 2 (1878) 219.

*Description of species.*—(From Boulenger.) “Rostral nearly as deep as broad; frontal a little longer than broad, longer than its distance from the end of the snout, a little shorter than the parietals; one præ- and two postoculars; temporals 1 + 3 or 2 + 3; five upper labials, third entering the eye; three lower labials in contact with the anterior chin-shields, which are small

and a little larger than the posterior. Scales in 25 to 29 rows. Ventrals 130–156, last frequently divided; anal divided; subcaudals 26–43. Coloration of upper parts very variable; lower parts uniform yellowish white.”

*Measurements of Fordonia leucobalia (Schlegel).*

|               | mm. |
|---------------|-----|
| Total length  | 930 |
| Snout to vent | 820 |
| Tail          | 110 |

*Remarks.*—This species is included on the strength of Boettger's record of a specimen from Manila, collected by Moellendorff.

#### LANGAHINÆ

Hypapophyses developed throughout the vertebral column; nostrils not valvular, lateral; terrestrial snakes. Not poisonous.

The bulk of this subfamily appears to be confined to Madagascar. It is surprising to find this single isolated genus *Hologerrhum* in the Philippines. This has been placed in the Langahinæ on the basis of the diagnostic characters given by Boulenger. Save for this fact it might easily be regarded as a species of *Cyclocorus*, which it resembles in a superficial manner.

#### Genus HOLOGERRHUM Günther

*Hologerrhum* GÜNTHER, Cat. Col. Snakes (1858) 186; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 33; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 438.

“Maxillary teeth 20, equal, followed, after a short interspace, by a pair of enlarged, grooved fangs; anterior mandibular teeth strongly enlarged. Head slightly distinct from neck; eye moderate, with round pupil. Body cylindrical; scales smooth, without pits, in 17 rows; ventrals rounded. Tail moderate; subcaudals single. Hypapophyses developed throughout the vertebral column \* \* \*.” (*Boulenger.*)

This genus, comprising a single species, is confined to the Philippine Islands.

#### HOLOGERRHUM PHILIPPINUM Günther

##### PLATE 7, FIG. 1

*Hologerrhum philippinum* GÜNTHER, Cat. Col. Snakes (1858) 186; Proc. Zool. Soc. London (1873) 171, pl. 18, fig. B; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 33; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 438; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 263 (*Hologerrhum* err. typ.).

*Cyclochorus maculatus* JAN, Icon. Gén. (1870) 36, pl. 6, fig. 3.

*Cyclochorus lineatus maculata* FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81.

*Description of species.*—(From Boulenger.) “Rostral broader than deep, scarcely visible from above; internasals as long as broad, a little shorter than the præfrontals; frontal twice as long as broad, longer than its distance from the end of the snout, a little shorter than the parietals; loreal as long as deep; two præ- and two postoculars; temporals, 1 + 1; eight upper labials, third, fourth, and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 17 rows. Ventrals 144; anal entire; subcaudals 40. Brown above, with a few alternating black spots on the anterior part of the back, and one or two black cross-bars behind the head; a black streak on each side of the head; passing through the eye; upper lip yellowish; a black line on each side of the posterior part of the body and of the tail; lower parts yellowish, with a black dot at the outer end of each ventral shield; on the tail these dots are confluent into a line.”

*Measurements of Hologerrhum philippinum Günther.*

|               | mm. |
|---------------|-----|
| Total length  | 280 |
| Snout to vent | 228 |
| Tail          | 52  |

*Remarks.*—The exact type locality of this species is no longer known, and only a few specimens have been collected. Fischer reports it from southern Mindanao, and a specimen was recently taken in northern Kalinga, Luzon.†

CORONELLINÆ

Hypapophyses absent on the posterior dorsal vertebræ, the lower surfaces of which are smooth. All maxillary teeth solid, none grooved. Scales imbricating, ventrals enlarged transversely. Nonpoisonous.

A large number of genera belong to this family. They occur in all temperate and tropical parts of the world. Fifteen genera are recognized in the Philippines.

*Key to the Philippine genera of the Coronellinæ.*

- a<sup>1</sup>. Anterior temporals present; parietals separated from labials.
  - b<sup>1</sup>. Pupil vertically elliptical.
    - c<sup>1</sup>. Scales without apical pits, smooth.
      - d<sup>1</sup>. Posterior maxillary teeth increasing in size; anterior maxillary and mandibular teeth strongly enlarged; anterior maxillary teeth separated from the rest by an interspace; scales in 17 to 19 rows..... Ophites Wagler (p. 118).

† Boulenger, Cat. Snakes Brit. Mus. 3 (1896) 33, in a footnote states: “The specimen from Placer, Mindanao, referred to this species by Günther (Proc. Zool. Soc. 1879, p. 78), belongs to *Cyclocorus lineatus*.”

- d*<sup>1</sup>. Anterior maxillary teeth, increasing in size to eighth which is much enlarged, followed by an interspace, followed by 3 small and 3 large teeth; scales in 17 rows.  
Haplonodon Griffin (p. 126).
- d*<sup>1</sup>. Anterior maxillary teeth, 15 to 20, increasing in size toward the middle of the series, then decreasing to the last 2 or 3 which are large; anterior mandibular teeth large; scales in 17 rows.  
Stegonotus Duméril and Bibron (p. 129).
- c*<sup>2</sup>. Scales with or without apical pits (absent in Philippine species); scales smooth; maxillary teeth, 8 to 10, rather short but stout, increasing in size posteriorly; anterior mandibular teeth slightly larger than posterior; scales in 13 or 15 rows.  
Dryocalamus Günther (p. 131).
- b*<sup>1</sup>. Pupil round.
- c*<sup>1</sup>. Longitudinal scale rows in even numbers; maxillary teeth, 20 to 23, increasing in size posteriorly; scales in 14 to 18 rows, with apical pits. Large snakes..... Zaocys Cope (p. 134).
- c*<sup>2</sup>. Longitudinal scale rows in odd numbers.
- d*<sup>1</sup>. Ventrals and subcaudals not or but feebly keeled.
- e*<sup>1</sup>. Maxillary teeth, 8 to 12, posteriorly compressed; scales in 13 to 21 rows, smooth or feebly keeled, with or without apical pits..... Holarchus Cope (p. 138).
- e*<sup>2</sup>. Similar to *Holarchus*; maxillary teeth, 6 to 8, posteriorly compressed; pterygoid teeth absent, palate without teeth, or with 2 or 3 on each palatine; scales in 15 to 17 rows.  
Oligodon Boie (p. 146).
- e*<sup>3</sup>. Maxillary teeth equal or nearly so, or posterior ones slightly decreasing in size.
- f*<sup>1</sup>. Scales with apical pits. Large snakes.
- g*<sup>1</sup>. Scales in 23 to 27 rows..... Gonyosoma Wagler (p. 152).
- g*<sup>2</sup>. Scales in 21 rows..... Elaphe Fitzinger (p. 155).
- f*<sup>2</sup>. Scales without apical pits..... Liopeltis Fitzinger (p. 161).
- d*<sup>2</sup>. Ventral and subcaudal scales strongly keeled and notched.
- e*<sup>1</sup>. Maxillary teeth, 20 to 33, slightly enlarged posteriorly; median scale row distinctly enlarged; scales in 13 to 15 rows, with apical pits..... Dendrophis Boie (p. 165).
- e*<sup>2</sup>. Maxillary teeth, 18 to 23, anterior longest; median scale row not or but slightly enlarged; scales in 13 to 15 rows, with apical pits..... Dendrelaphis Boulenger (p. 169).
- a*<sup>2</sup>. No anterior temporals; parietals in contact with labials.
- b*<sup>1</sup>. Internasals present.
- c*<sup>1</sup>. Eye distinct..... Pseudorhabdium Boulenger (p. 177).
- c*<sup>2</sup>. Eye hidden..... Typhlogeophis Günther (p. 182).
- b*<sup>2</sup>. Internasals absent; eye distinct..... Calamaria Boie (p. 183).

### Genus OPHITES Wagler

*Lycodon*, part., BOIE, Isis (1827) 521; WAGLER, Syst. Amph. (1830) 186; SCHLEGEL, Phys. Serp. 2 (1837) 104; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 367; GÜNTHER, Cat. Col. Snakes (1858) 201; Rept. Brit. India (1864) 315; JAN, Elenco Sist. Ofid. (1863) 95.

*Ophites* WAGLER, Syst. Amph. (1830) 186; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 397; GÜNTHER, Cat. Col. Snakes (1858) 206; Rept. Brit. India (1864) 322; JAN, Elenco Sist. Ofid. (1863) 95; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 356; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 258.\*

*Cercaspis* WAGLER, Syst. Amph. (1830) 191; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 389; GÜNTHER, Cat. Col. Snakes (1858) 207; Rept. Brit. India (1864) 323; JAN, Elenco Sist. Ofid. (1863) 94.

*Leptorhytaon* GÜNTHER, Cat. Col. Snakes (1858) 205; Rept. Brit. India (1864) 323.

*Tetragonosoma* GÜNTHER, Cat. Col. Snakes (1858) 253; Rept. Brit. India (1864) 320.

*Tytleria* THEOBALD, Cat. Rept. As. Soc. Mus. (1868) 66.

*Lycodon* BOULENGER, Fauna Brit. India, Rept. (1890) 291; Cat. Snakes Brit. Mus. 1 (1893) 348; BOETTGER, Ber. Senck. Nat. Ges. (1886) 114; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 437.

"Maxillary bent inwards anteriorly in the adult, the three to six anterior teeth increasing in size, fang-like, and separated by a toothless interspace from the rest, seven to fifteen in number, which increase in size posteriorly; anterior mandibular teeth longest, fang-like. Head not or but slightly distinct from neck, more or less depressed; eye small or moderate, with vertically elliptic pupil; nostril large or rather large. Body more or less elongate, cylindrical or slightly compressed; scales smooth or keeled, in 17 or 19 rows, with apical pits; ventrals with or without a lateral keel. Tail moderate; subcaudals single or double." (*Boulenger.*)

The genus is a comparatively large one with about eighteen known species. It is distributed over southern Asia, and the Malay Peninsula and Archipelago. Three species enter the Philippines, but only the rare *Ophites tessellatus* (Jan) appears to be confined to the Islands. The species best known in the Philippines is *Ophites aulicus* (Linnæus), which is commonly found about houses and stone walls. This species is known as *culebra casera* and *ahas-na-tulog* (sleeping snake). The latter name is indeed a good one, as it describes its characteristic habit of remaining motionless when first disturbed. The species of this genus appear to feed almost wholly on small lizards of the Geckonidæ and Scincidæ. They are absolutely harmless and rarely attempt to bite. They thrive well in captivity and readily take food.

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\* Stejneger, Bull. U. S. Nat. Mus. 58 (1907) 356 b, has shown that the long-accepted name *Lycodon* is fixed for a South American genus of snakes, usually known as *Lycognathus*. The next name chronologically is *Ophites* Wagler.

*Key to the Philippine species of Ophites Wagler.\**

a<sup>1</sup>. A preocular, separating eye from prefrontal.

b<sup>1</sup>. Nasal single; ventrals not angulate..... *O. tessellatus* (Jan) (p. 124).

b<sup>2</sup>. Two nasals; ventrals laterally angulate.. *O. aulicus* (Linnæus) (p. 120).

a<sup>2</sup>. No preocular; prefrontal entering eye..... *O. subcinctus* (Boie) (p. 124).

**OPHITES AULICUS (Linnæus)**

*Coluber aulicus* LINNÆUS, Mus. Ad. Frid. 1 (1754) 29, pl. 12, fig. 2; Syst. Nat. ed. 10 1 (1758) 220.

*Lycodon aulicus* BOIE, Isis (1827) 551; COPE, Proc. Acad. Sci. Philadelphia (1860) 262 (var.); PETERS, Mon. Berl. Ak. (1861) 688; GÜNTHER, Rept. Brit. India (1864) 316; Proc. Zool. Soc. London (1879) 18; Zool. Rec. (1870) 75; JAN, Icon. Gén. (1870) 36, pl. 4, fig. 1; THEOBALD, Cat. Rept. Brit. India (1876) 199; MURRAY, Zool. Sind. (1884) 383; FISCHER, Jahrb. wiss. Anst. Hamburg (1885) 81; BOULENGER, Fauna Brit. India, Rept. (1890) 294; Cat. Snakes Brit. Mus. 1 (1893) 352 (and varieties); BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 114.

*Lycodon capucinus* BOIE, Isis (1827) 551.

*Lycodon unicolor* BOIE, Isis (1827) 551.

*Lycodon hebe* SCHLEGEL, Phys. Serp. 2 (1837) 106, pl. 4, figs. 1-6.

*Lycodon aulicus*, part., CANTOR, Cat. Mal. Rept. (1847) 68; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 369; GÜNTHER, Cat. Col. Snakes (1858) 201.

*Tytleria hypsirhinoides* THEOBALD, Cat. Rept. As. Soc. Mus. (1868) 66.

*Ophites aulicus* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 596; § D 6 (1911) 258; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359.

*Description of species.*—(From No. 161, E. H. Taylor collection; collected in Manila, June 1, 1915, by E. H. Taylor.) Snout and head rather flattened, lips extended; rostral much broader than deep, scarcely visible from above, bent at a strong angle; internasals moderate, not quite as long as prefrontals; latter form their longest suture with each other, their sutures with other scales being subequal in length; frontal not twice as long as wide, forming its longest suture with supraocular, the suture with preocular being very small; length of frontal nearly equal to its distance from end of snout; parietals longer than but not as wide as frontal, bounded behind by 3 enlarged scales, 1 medially and 2 laterally; nostril pierced between 2

\* Casto de Elera lists *Lycodon modestum* Schlegel (= *Stegonotus modestum*); *Lycodon bairdi* Steindachner (= *Psammodynastes pulverulentus*); *Lycodon culcullatum* (= *Stegonotus culcullatus*), which probably does not occur in the Philippines; and *Lycodon capucinus*, which is a variety of *Ophites aulicus*.

small nasals, the anterior somewhat the larger; loreal large, sub-rectangular, forming its longest suture with prefrontal, not twice as long as wide; a large preocular extending from frontal to third labial; supraocular smaller than preocular but a little longer; 2 small postoculars sub-

equal in size. Temporals  $\frac{1}{1+2} + 4$ ; 9

upper labials, fifth, sixth, seventh, and eighth largest; third, fourth, and fifth labials entering eye; 10 lower labials, sixth and fifth largest; mental small; 5 labials touch first chin shields (4 on right side); mental small, triangular; 2 pairs of chin shields, first pair longest, nearly equal in length to first labials; scales in 17 rows, smooth, outer row somewhat enlarged; eye small, pupil vertical; head distinct from body, very much flattened, with lips and temporal regions swollen; ventrals, 197; anal double; subcaudals, 74, double; tail slender, terminating in a long, sharp point.

*Color in life.*—Grayish slate to purplish brown above with an irregular network formed by darker scales bordered with white; on neck a dim lighter band forming a broad collar; fore part of head darker slate; lips and neck whitish, each scale with a darker area; lower surfaces immaculate cream white.

*Variation.*—But little variation occurs in this species among specimens found in the various Philippine islands. The following differences, however, are in evidence. Specimens from the Visayan islands of Masbate, Bantayan, and Negros have the temporals  $1 + 2$  for the most part instead of  $2 + 3$ , which is the usual formula elsewhere. It will be noted from the table that there is a tendency to a reduction in the number of labials touching the anterior chin shields in Luzon specimens. The range of ventrals is 194 to 210; of subcaudals, 62 to 78. These counts are well within the limits set by Boulenger.\*

One specimen in the collection from Almoza, India, differs considerably. The head is rather narrow and pointed; the preoculars are not in contact with the frontal, which is true of Philippine specimens; the frontal is proportionally shorter, and

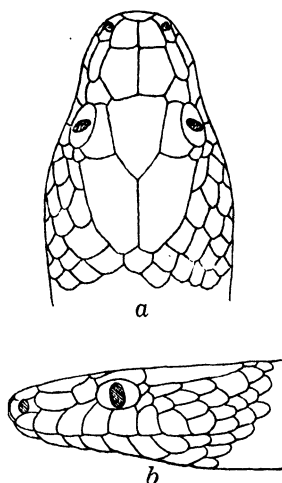


FIG. 11 *Ophites aulicus* (Linnaeus); after Boulenger; a, head, dorsal view; b, head, lateral view.

\* Loc. cit.

the subcaudal count is 89, much higher than the range limit noted by Boulenger.\* The whitish network on the body forms rather definite white bars on the anterior part of the body.

*Remarks.*—Boulenger \* has referred all his Philippine specimens under his "variety D" (*Lycodon aulicus carpinus* Boie).

In the more than thirty Philippine specimens examined, I find no variations which warrant subspecific treatment. I find that variations in markings are due chiefly to age; variations in scalation for the most part do not appear constant. This species is known to occur in most of the larger Philippine islands, with the possible exception of Palawan, and in some of the smaller ones. Griffin states that a specimen was taken in Palawan by C. M. Weber and that this is in the Bureau of Science collection. The only one of this species collected by Weber in the collection is from Cuyo, and I believe this is the specimen referred to by Griffin. Certainly if it is found in Palawan it is

TABLE 20.—Measurements and scale counts of *Ophites aulicus* (Linnæus).

| No.    | Locality.              | Collector.                         | Sex. | Length. |     | Tail. | Ventrals. | Sub-caudals. |
|--------|------------------------|------------------------------------|------|---------|-----|-------|-----------|--------------|
|        |                        |                                    |      | mm.     | mm. |       |           |              |
| 165    | Occidental Negros..... | H. McNamara .....                  | ♀    | 578     | 74  | 199   | *37       |              |
| 166    | .....do .....          | .....do .....                      | ♀    | 485     | 86  | 200   | 65        |              |
| 167    | .....do .....          | E. H. Taylor .....                 | ♂    | 460     | 92  | 189   | 70        |              |
| 168    | .....do .....          | H. McNamara .....                  | ♂    | 325     | 53  | 199   | 63        |              |
| 170    | .....do .....          | .....do .....                      | ♀    | 470     | 85  | 202   | 67        |              |
| 171    | .....do .....          | .....do .....                      | ♂    | 310     | 65  | 200   | 65        |              |
| 174    | .....do .....          | .....do .....                      | ♀    | 480     | 91  | 198   | 66        |              |
| 286    | Masbate .....          | V. Lednický .....                  | ♀    | 360     | 63  | 198   | 65        |              |
| 287    | .....do .....          | .....do .....                      | ♀    | 385     | 65  | 199   | 62        |              |
| 663    | Bantayan .....         | L. E. Griffin .....                | ♀    | 500     | 30  | 198   |           |              |
| 837    | .....do .....          | .....do .....                      | ♂    | 360     | 50  | 195   |           |              |
| 654    | Cuyo .....             | C. M. Weber .....                  | ♂    | 510     | 91  | 190   | 70        |              |
| 1484   | Mindoro .....          | Marine Biological Expedition ..... | ♂    | 540     | 93  | 191   | 66        |              |
| 84     | Manila .....           | L. E. Griffin .....                | ♂    | 525     | 110 | 194   | 76        |              |
| 641    | .....do .....          | W. Schultze .....                  | ♀    | 580     | 96  | 198   | 66        |              |
| 1325   | .....do .....          | L. E. Griffin .....                | ♀    | 780     | 103 | 206   | *43       |              |
| 1329   | .....do .....          | .....do .....                      | ♀    | 781     | 132 | 202   | 69        |              |
| 1520   | .....do .....          | S. F. Light .....                  | ♂    | 578     | 103 | 206   | 78        |              |
| 1524   | .....do .....          | .....do .....                      | ♂    | 565     | 88  | 210   | 67        |              |
| 1529   | .....do .....          | .....do .....                      | ♂    | 637     | *95 | 204   | *56       |              |
| 1552   | .....do .....          | L. E. Griffin .....                | ♂    | 445     | 92  | 194   | 71        |              |
| 161    | .....do .....          | E. H. Taylor .....                 | ♀    | 522     | 105 | 197   | 74        |              |
| R 1314 | Almora, India .....    | .....do .....                      | ♂    |         |     | 205   | 89        |              |

\* Mutilated.

\* Catalogue, loc. cit.

TABLE 20.—Measurements and scale counts of *Ophites aulicus* (Linnæus)—Continued.

| No.    | Labials. |        |            |                     | Postoculars. | Scale rows. | Temporals.   | Collection.        |
|--------|----------|--------|------------|---------------------|--------------|-------------|--|--------------------|
|        | Upper.   | Lower. | Enter eye. | Touch chin shields. |              |             |  |                    |
| 165    | 9        | 10     | 3, 4, 5    | 5                   | 1            | 17          | 2+3  | E. H. Taylor.      |
| 166    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | $\left\{ \begin{array}{l} 1+2+3 \\ 2+3 \end{array} \right\}$ | Do.                |
| 167    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | $\left\{ \begin{array}{l} 1 \\ 2 \end{array} + 3 \right\}$   | Do.                |
| 168    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 1+2+3  | Do.                |
| 170    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 1+2+3  | Do.                |
| 171    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 1+2+3  | Do.                |
| 174    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | $\left\{ \begin{array}{l} 1+3 \\ 2 \end{array} \right\}$     | Do.                |
| 286    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | $\left\{ \begin{array}{l} 1 \\ 1+2+4 \end{array} \right\}$   | Do.                |
| 287    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 1+2+3  | Do.                |
| 663    | 9        | 10     | 3, 4, 5    | 4-3                 | 2            | 17          | 1+2+3  | Bureau of Science. |
| 837    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 1+2+3  | Do.                |
| 654    | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 2+3  | Do.                |
| 1484   | 9        | 10-9   | 3, 4, 5    | 5-4                 | 2            | 17          | 2+3  | Do.                |
| 84     | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 2+3  | Do.                |
| 641    | 9        | 10-9   | 3, 4, 5    | 4-5                 | 2            | 17          | 2+3  | Do.                |
| 1325   | 9        | 10     | 3, 4, 5    | 4                   | 2            | 17          | 2+3  | Do.                |
| 1329   | 9        | 10     | 3, 4, 5    | 4-5                 | 2            | 17          | 2+3  | Do.                |
| 1520   | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | $\left\{ \begin{array}{l} 2+3 \\ 2+4 \end{array} \right\}$   | Do.                |
| 1524   | 9        | 10     | 3, 4, 5    | 4-5                 | 2            | 17          | $\left\{ \begin{array}{l} 2+3 \\ 2+4 \end{array} \right\}$   | Do.                |
| 1529   | 9        | 10     | 3, 4, 5    | 4-5                 | 2-1          | 17          | 2+3  | Do.                |
| 1552   | 9        | 10     | 3, 4, 5    | 4-5                 | 2            | 17          | 2+3  | Do.                |
| 161    | 9        | 10     | 3, 4, 5    | 5-4                 | 2            | 17          | $\left\{ \begin{array}{l} 1 \\ 1+2+4 \end{array} \right\}$   | E. H. Taylor.      |
| R 1314 | 9        | 10     | 3, 4, 5    | 5                   | 2            | 17          | 2+4  | Bureau of Science. |

rare, since several other collections made there contain no specimen of this common snake.

In Manila it is especially common in houses, where it feeds on the small geckos, *Peropus mutilatus*, *Cosymbotus platyurus*, and *Hemidactylus frenatus*. One gentleman assured me that he had killed fourteen in his house during a single rainy season. It is absolutely harmless, usually very gentle, and may be handled with impunity.

Known from Luzon, Mindanao, Mindoro, Panay, Negros, Bantayan, Masbate. It is uncommon in eastern Mindanao, as not a specimen was found in my two years' collecting there. Fischer \* reports *Lycodon aulicus* var. from southern Mindanao.

\* Loc. cit.

## OPHITES TESSELLATUS (Jan)

- Lycodon tessellatus* JAN, Elenco Sist. Ofid. (1863) 96; Icon. Gén. (1870) 36, pl. 4, fig. 2; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 17; BOETTGER, Ber. Senck. Nat. Ges. (1886) 114; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 351; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 437.  
*Ophites tessellatus* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 258 (typ. err.)

*Description of species.*—"Snout moderately depressed; eye rather small. Rostral broader than deep, just visible from above; internasals much shorter than the præfrontals; frontal nearly as long as its distance from the end of the snout, slightly shorter than the parietals; loreal elongate, not entering the eye, forming a suture with the internasal; one præ- and two postoculars; temporals small, scale-like, 2 + 3; nine upper labials, third, fourth, and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales smooth, in 17 rows. Anal divided. Subcaudals in two rows. Above with three series of alternating black spots; ventrals and subcaudals brown, edged with whitish." (Boulenger.)

*Remarks.*—The type locality is "Manila auf Luzon." This is the only exact locality known. Müller's specimen is labeled "Philippinen." Evidently this species is very rare.

## OPHITES SUBCINCTUS (Boie)

## PLATE 8

- Lycodon subcinctus* BOIE, Isis (1827) 551; SCHLEGEL, Phys. Serp. 2 (1837) 117, pl. 4, figs. 14, 15; BOULENGER, Proc. Zool. Soc. London (1890) 34.  
*Lycodon platurinus* CANTOR, Cat. Mal. Rept. (1847) 69.  
*Ophites subcinctus* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 398; GÜNTHER, Cat. Col. Snakes (1858) 206; Rept. Brit. India (1864) 322; JAN, Icon. Gén. (1870) 36, pl. 5, fig. 4; BLANFORD, Proc. Zool. Soc. London (1881) 222, pl. 21, fig. 2; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 596; § D 6 (1911) 258.  
*Elapoides annulatus* SAUVAGE, Bull. Soc. Philom. VII 8 (1884) 144.

*Description of species.*—(From No. 659, Bureau of Science collection; collected at Iwahig, Palawan, August 26, 1908, by C. M. Weber.) (Adult male.) Head and snout much depressed, almost spatulate; rostral scarcely visible above, much broader than high, the sutures with internasals and nasals subequal; internasals small, about one-third the size of præfrontals, narrowed medially, about as wide as long; præfrontals large, about as wide as long, longest on sides, forming mutual suture, entering eye; frontal longer than wide, longer than and more than twice as wide as supraoculars, much shorter than its dis-

tance from end of snout, and much shorter than parietals; latter moderate, about one and a half times as long as broad, bordered by 3 temporals and a postocular; nasal apparently entire, narrowed in the middle, the posterior portion higher and rather pointed behind; no preocular; loreal elongate, twice as long as high, widely separated from internasal, entering eye, in contact with 2 labials below; supraocular about twice as long as wide; 2

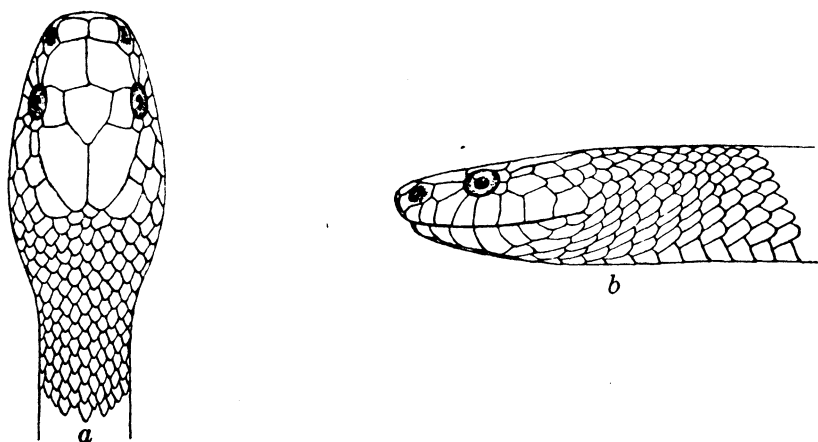


FIG. 12. *Ophites subcinctus* (Boie); drawing of a Palawan specimen; a, head, dorsal view; b, head, lateral view;  $\times 2$ .

small postoculars; temporals  $2 + 2 + 2$  on left side, and  $1 + 2 + 2$  on right, third upper largest; 8 upper labials, third, fourth, and fifth entering eye, seventh largest; mental very small, wider than deep; 9 lower labials, 4 touching anterior chin shields, which are wider and somewhat enlarged; scales in 17 rows, the 11 median rows slightly but distinctly keeled; ventrals, 208, angulate laterally; anal divided; subcaudals, 64 pairs; eye small, less than its distance from nostril.

*Color in alcohol.*—Above dull purplish, banded with 10 light lavender bands, each about 6 scales wide, darker medially; the first band crosses occipital region; labials light colored; throat and belly yellowish without markings; tail dimly banded with 6 bands almost same shade as ground color; below yellowish white.

*Measurements of Ophites subcinctus (Boie).*

|               | mm. |
|---------------|-----|
| Total length  | 505 |
| Snout to vent | 416 |
| Tail          | 89  |
| Width of head | 11  |

*Variation.*—A second specimen in the collection agrees with the described specimen, save that the head is less flattened, due

probably to the fact that it is younger. The rostral is a little more exposed above, and the postoculars are fused into one scale. The temporal formula is  $1 + 2 + 2$ . The color above is a dark brown with 16 white bands from head to tail; a brown streak, partially following the parietal suture, divides the occipital band.

TABLE 21.—Measurements and scale counts of *Ophites subcinctus* (Boie).

| No. | Locality.       | Collector.  | Sex or age. | Length. | Tail.  |
|-----|-----------------|-------------|-------------|---------|--------|
| 659 | Iwahig, Palawan | C. M. Weber | ♂           | mm. 505 | mm. 89 |
| 751 | do              | do          | yg          | 254     | 44     |

| No. | Ventrals. | Subcaudals. | Anal. | Scale rows. | Labials enter eye. | Postoculars. | Width of head. | Collection.        |
|-----|-----------|-------------|-------|-------------|--------------------|--------------|----------------|--------------------|
| 659 | 208       | 64          | 2     | 17          | 3, 4, 5            | 2            | 11             | Bureau of Science. |
| 751 | 199       | 64          | 2     | 17          | 3, 4, 5            | 1            | 7              | Do.                |

The Palawan form agrees quite well with the specimens from Asia and Java. Boulenger gives the variation in ventrals as 198 to 227; in subcaudals, 61 to 89. He also mentions the following variations: Sometimes the sixth labial enters the eye, making 4 in all; sometimes the loreal does not enter the eye; the anal is rarely entire. The two specimens above recorded are the first and, I believe, the only records for the Philippines.

#### Genus **HAPLONODON** Griffin

*Haplonodon* GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 211; § D 6 (1911) 258.

"Maxillary teeth in two series, separated by a short interspace; the posterior teeth of each series largest, 14 or 15 in all. Anterior end of maxilla bent slightly inward.

"Anterior mandibular teeth enlarging to the fourth, followed by smaller teeth of equal size. Head distinct from neck. Eye moderate, pupil vertically elliptic. Body slender, slightly compressed; tail long. Scales smooth, in 17 longitudinal rows, without apical pits; subcaudals in two rows." (*Griffin.*)

Only a single species known. Exclusively a Philippine form.

#### **HAPLONODON PHILIPPINENSIS** Griffin

##### PLATE 9

*Haplonodon philippinensis* GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 212, text fig. 1, pl. 1; § D 6 (1911) 258.

*Description of species.*—(From the type, No. 883, Bureau of Science collection; collected in Polillo, October 1909, by C. Canozado.) (Adult male.) Anterior end of maxillary curved inward but slightly; teeth on maxilla increase in size from first to eighth, the last 3 or 4 strong and fanglike; after a short interspace 3 small teeth follow, which in turn are followed by 3 large teeth, fanglike and laterally compressed; the 4 anterior mandibular teeth increase in size to fourth, and are considerably larger than the remaining ones which are of nearly equal size; head somewhat triangular, rather flat, distinct from neck; rostral broader than deep, folded about snout, its posterior part pointed and entering between internasals, the portion visible above being equal to one-third its distance from rostral; internasals small, narrowed medially, the suture between them one-third to one-fourth that between prefrontals; latter large, more than four times the size of internasals, more than two-thirds the length of frontal; latter almost straight on its anterior margin, about as broad as long, twice the width of supraoculars and a little longer; parietals elongate, bordered by 3 (4 on right side)

temporals, nearly twice as long as frontal; nasal single, of very irregular shape, elongate, anterior part much lower than posterior; nostril pierced obliquely; a loreal present, more than twice as long as wide, entering eye; a single preocular narrowly separated from frontal; 2 small subequal postoculars; temporals 2 + 2; 9 upper labials, fourth



FIG. 13. *Haplonodon philippinensis* Grif-fin; a, head, dorsal view; b, head, ventral view.

and fifth entering eye, seventh and eighth largest and nearly equal, 9 lower labials, 5 in contact with anterior chin shields which are larger than posterior; mental much wider than deep; scales smooth, in 17 rows, without apical pits; body slender, distinctly compressed; lateral keels on ventrals, but scales not noticeably notched; ventrals, 203; anal entire; subcaudals, 95 (tip of tail missing).

*Color.*—Dorsal surface of body and tail crossed by seventy-nine dark brown bands, separated by narrow bands of white, finely dotted with brown; the edges of latter bands pure white, outlining the darker and broader bands prettily; in the dorsal portions of the lighter bands the brown dots are often confluent, producing a grayish brown color; dots finer and more

separated toward ventral surface; ventral portions of most of the brown bands narrowly separated from dorsal parts by fine white lines; a large brown spot on end of most of ventral scales; ventral surface of head and body white; brown dots become increasingly numerous on lower surface as anus is approached; lower surface of tail closely covered with brown dots; upper surface of head very dark brown, almost black, adorned by a reticulate pattern of fine white lines; centers and lower edges of upper labial scales white, their adjoining edges brown; all scales extremely smooth and glossy.

*Measurements of Haplonodon philippinensis Griffin.*

|              | mm. |
|--------------|-----|
| Total length | 800 |
| Tail         | 196 |
| Head length  | 23  |
| Head width   | 13  |

*Variation.*—A second specimen taken near Los Baños, Luzon, is smaller and immature. The head is triangular, very distinct from body, and noticeably flattened. There are eighty-five brown bars across the body, thirty-one of which belong to the tail. The tail is extremely slender. The color of the specimen is darker brown than that of the adult described.

TABLE 22.—*Measurements and scale counts of Haplonodon philippinensis Griffin.*

| No.   | Locality.             |  |  |  |  | Collector.          | Sex-<br>or age. | Length.    |
|-------|-----------------------|--|--|--|--|---------------------|-----------------|------------|
| * 883 | Polillo.....          |  |  |  |  | C. Canonizado ..... | ♂               | mm.<br>800 |
| 211   | Los Baños, Luzon..... |  |  |  |  | E. H. Taylor .....  | yg              | 305        |

| No.   | Tail. | Ventrals. | Sub-caudals. | Upper labials. | Scale rows. | Labials enter eye. | Collection.        |
|-------|-------|-----------|--------------|----------------|-------------|--------------------|--------------------|
|       | mm.   |           |              |                |             |                    |                    |
| * 883 | 196   | 208       | 95           | 9              | 17          | 4, 5               | Bureau of Science. |
| 211   | 81    | 206       | 127          | 9              | 17          | 4, 5               | E. H. Taylor.      |

\* Type.

*Remarks.*—These two specimens are the only ones known, which is rather remarkable in view of the fact that the localities known are on separate islands. Evidently it is extremely rare.

It is unknown to the inhabitants of Polillo, according to Griffin.\* The people in the locality where it was taken by myself said they had never seen a similar specimen.

\* Philip. Journ. Sci. § D 5 (1910) 213.

Genus **STEGONOTUS** Duméril and Bibron

*Lycodon*, part., SCHLEGEL, Phys. Serp. 2 (1837) 104; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 367; JAN, Elenco Sist. Ofid. (1863) 97. *Stegonotus* DUMÉRIL and BIBRON, Mém. Ac. Sci. 23 (1853) 477; Erp. Gén. 7 (1854) 680; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 364.

*Herpetodryas*, part., JAN, Elenco Sist. Ofid. (1863) 80.

*Liophis* GÜNTHER, Proc. Zool. Soc. London (1863) 59; (1877) 129.

*Zamenophis* GÜNTHER, Ann. & Mag. Nat. Hist. IV 9 (1872) 21.

*Pseudolycodon* PETERS, Mon. Berl. Ak. (1876) 534.

*Spilotes* PETERS, Mon. Berl. Ak. (1861) 685; BOETTGER, Ber. Senck. Nat. Ges. (1886) 108; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 92.

*Odontomus* BOETTGER, Ber. Senck. Nat. Ges. (1886) 114; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 437.

"Maxillary teeth 15 to 20, increasing in size towards the middle of the series, then decreasing in size to the two or three last, which are again large; anterior mandibular teeth enlarged. Head more or less distinct from neck; eye moderate or rather small, with vertically elliptic pupil. Body elongate, cylindrical or feebly compressed; scales smooth, with apical pits, in 17 rows; ventrals obtusely angulate laterally. Tail moderate or long; subcaudals in double or single row." (*Boulenger.*)

There are two species known from the Philippines.

*Key to the Philippine species of Stegonotus Duméril and Bibron.*

$\alpha^1$ . Ventrals, 220 to 232; subcaudals, 100 pairs; over 2 meters in length  
S. muelleri Duméril and Bibron (p. 129).

$\alpha^2$ . Ventrals, 195 to 214; subcaudals, 112 to 123; about 1 meter in length  
S. dumerilii Boulenger (p. 130).

The genus *Stegonotus* is distributed over the eastern Philippines, the Moluccas, Papuasia, and northern Australia. No species has yet been discovered in Celebes or Borneo. The two species found in the Philippines are endemic. Both are rare. They are nonpoisonous.

**STEGONOTUS MUELLERI** Duméril and Bibron

*Stegonotus muelleri* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 682; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 367; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 259.

*Spilotes samarensis* PETERS, Mon. Berl. Ak. (1861) 685; BOETTGER, Ber. Senck. Nat. Ges. (1886) 108; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 429.

*Herpetodryas muelleri* JAN, Elenco Sist. Ofid. (1863) 81.

*Description of species.*—(After the type description of *Spilotes samarensis* Peters.) Frontal not quite as long as

broad, almost triangular, the anterior edge a straight line, rounded behind; an elongate loreal, longer than deep; 2 preoculars and 2 postoculars; 9 upper labials, fourth and fifth entering eye; 2 long anterior temporals followed by 3 others, the anterior in contact with postoculars, scales in 17 smooth rows; ventrals, 232; anal entire; subcaudals, 81 pairs.

*Color*.—Upper side of head dark olive, lips and underside dirty yellow-white; upper part of body darker with large, broad, dark flecks; below uniform dirty yellow.

*Measurements of Stegonotus muelleri Duméril and Bibron.*

|                | mm.   |
|----------------|-------|
| Total length   | 2,070 |
| Snout to vent  | 1,680 |
| Tail           | 390   |
| Length of head | 50    |

*Variation*.—Boulenger gives the known ventral range for the species 220 to 232; that of the subcaudals, 81 to 100. As to the color of the type (?) he states: "Uniform brown above; lips and lower parts dirty yellowish white."

*Remarks*.—Only three or four specimens of this rare snake have been found, all apparently from Samar Island. It attains a length of more than 2 meters. It is harmless to man.

**STEGONOTUS DUMERILII Boulenger**

*Lycodon mülleri* DUMÉRIL and BIBRON, *Erp. Gén.* 7 (1854) 82; GÜNTHER, *Cat. Col. Snakes* (1858) 203.

*Odontomus muelleri* GÜNTHER, *Proc. Zool. Soc. London* (1879) 78; BOETTGER, *Ber. Senck. Nat. Ges.* (1886) 114; CASTO DE ELERA, *Cat. Fauna Filipinas* 1 (1895) 437.

*Stegonotus dumerilii* BOULENGER, *Cat. Snakes Brit. Mus.* 1 (1893) 368; GRIFFIN, *Philip. Journ. Sci.* § D 6 (1911) 259.

*Description of species*.—(From an unnumbered specimen, Santo Tomás Museum, labeled "Filipinas," collector unknown; local name, *taling bilao*.) Head distinct from neck, rather spatulate; rostral broader than deep, narrowly but distinctly visible from above, pointed behind, nearly as deep as broad, its smallest suture formed with first labial, its largest with internasal; latter about as wide as deep, narrowed medially, the suture between them being about half of that between prefrontals; latter much broader than deep, in contact with both preoculars and forming their smallest suture with inferior preocular; frontal longer than broad, its sides nearly parallel, its anterior edge a straight line, as long as its distance from end of snout, shorter than parietals, scarcely twice as broad as

supraocular; parietals very much elongate, almost twice as broad as long, touching only 1 postocular; nasal elements mutilated but nasal apparently a single scale, elongate, the nostril near the middle; 1 loreal a little longer than high; 2 preoculars coequal in size, nearly as large as loreal and larger than postoculars; supraoculars nearly twice as long as wide; 3 postoculars, upper largest; temporals 2 + 3; 8 temporals bordering parietals; 9 upper labials, fourth and fifth entering eye, sixth and seventh largest; 9 lower labials, 5 touching anterior chin shields, which are very much larger than second pair and widely separated from each other at their upper ends; eye quite large, with pupil distinctly vertical, oval; 17 scale rows, smooth, outer row not enlarged; ventrals, 198; anal single; subcaudals, 122.

*Color in alcohol.*—Above dark purplish brown with eighteen white bands on body and fourteen on tail, each band three scales wide on back and widening to four or five on side; small whitish spots in temporal region and on lower edges of upper labials; yellowish below, of a muddy color under tail.

*Measurements of Stegonotus dumerilii Boulenger.*

|               | mm. |
|---------------|-----|
| Total length  | 335 |
| Snout to vent | 240 |
| Tail          | 95  |

*Remarks.*—I have been able to examine only this single, very young specimen of *Stegonotus dumerilii*. It differs from Boulenger's description in having 3 instead of 2 postoculars, and in the color and markings. However, these differences in color and markings may be due to the age of the specimen.

Boulenger lists four specimens. The ventrals and subcaudals vary between 195 and 214, and 112 and 123, respectively. The counts for the specimen described lie within these limits.

Known from Samar (Boettger), Surigao (Günther), and Dagara and the Iriga Volcano, Luzon (Peters). It is not known outside the Philippines.

**Genus DRYOCALAMUS Günther**

- Nympha* (non Martini) FITZINGER, Neue Class. Rept. (1826) 29.  
*Lycodon*, part., SCHEGEL, Phys. Serp. 2 (1837) 104.  
*Odontomus* (non Kirby) DUMÉRIL and BIBRON, Mem. Ac. Sci. 23 (1853) 463; Erp. Gén. 7 (1854) 450; GÜNTHER, Cat. Col. Snakes (1858) 206; JAN, Elenco Sist. Ofid. (1863) 95; GÜNTHER, Rept. Brit. Ind. (1864) 233.  
*Dryocalamus* GÜNTHER, Cat. Col. Snakes (1858) 121; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 369.

- Hydrophobus* GÜNTHER, Ann. & Mag. Nat. Hist. III 9 (1862) 127;  
 BOULENGER, Fauna Brit. India, Rept. (1890) 297.  
*Nymphophidium* GÜNTHER, Rept. Brit. India (1864) 235.  
*Ulupe* BLANFORD, Journ. As. Soc. Bengal 47 (1878) 129.

"Maxillary teeth 8 to 10, rather short but stout, increasing in size posteriorly; anterior mandibular teeth a little longer than the posterior; one or two more or less distinct tooth-like knobs on the basisphenoid. Head distinct from neck, much depressed; eye moderate or rather large, with vertically elliptic pupil. Body slender, slightly compressed; scales smooth, in 13 or 15 rows, with apical pits;\* ventrals strongly keeled on each side. Tail moderate; subcaudals in two rows." (Boulenger.)

The genus is small, only six or seven species being known. Three are found in the East Indies. *Dryocalamus subanulatus* is confined to the Malay Peninsula and Sumatra; *D. tristrigatus* is found in Borneo and the Natuna Islands; and *D. philippinus* is found in Palawan. The last species resembles *D. tristrigatus* in markings, and is otherwise similar save for the absence of apical pits on scales. Snakes of this genus are harmless.

#### DRYOCALAMUS PHILIPPINUS Griffin

PLATE 10, FIG. 2; PLATE 11, FIGS. 1 AND 2

*Dryocalamus philippinus* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 596; § D 6 (1911) 259.

*Description of species.*—(From No. 240, E. H. Taylor collection; collected at Balabac, 1915, by C. M. Weber.) Head distinct from neck, rather flattened; rostral more than one and a half times as broad as high; part visible above less than one-third its distance from frontal; internasals about as wide as long, the suture between them equaling the suture between prefrontals; latter larger than internasals, bending down on sides, wider than deep; frontal broadly angled anteriorly, less than one and one-third times as long as broad, longer than its distance from end of snout, as long as or minutely shorter than parietals; latter longer than wide, touching superior postocular; nasal large, with nostril very small, pierced near its center; loreal very large, nearly twice as long as wide, entering eye; no preocular (or, if present, fused with supraocular); 3 postoculars, subequal in size; 2 anterior temporals with the formula  $\frac{1}{1+2} + 3$ ; 7 upper labials, third and fourth entering eye; labials

\* There are no apical pits in *Dryocalamus philippinus* Griffin.—E. H. T.

in the following order of size: sixth, fifth, fourth, third, seventh, second, first; 7 lower labials, 4 touching anterior chin shields, which are more than twice as large as second pair; scales in 15 smooth rows, without apical pits; ventrals, 216; subcaudals, 87; both ventrals and subcaudals strongly keeled and turned up on side; anal single.

*Color in alcohol.*—Above dark black-brown with a median cream-colored stripe covering median scale rows and the edges of the two adjoining rows; a second stripe on fourth row of scales; below this a black-brown stripe covering third and part of second scale rows; outer scale row cream; below immaculate, the lateral edges of ventrals with brown dots except on anterior part of body; head dark with lighter markings of cream on posterior part of head; upper labials yellowish.

*Measurements of Dryocalamus philippinus Griffin.*

|                | mm. |
|----------------|-----|
| Total length   | 375 |
| Snout to vent  | 287 |
| Tail           | 88  |
| Length of head | 15  |
| Width of head  | 6.8 |

*Variation.*—The type is a small immature specimen in the Bureau of Science collection and was collected by W. Schultze in Iwahig, Palawan. A second specimen in the Bureau of Science collection is also from Palawan. This specimen has largely lost its color in alcohol; the head has much more light marking than the described specimen, and agrees with that of the type.

TABLE 23.—*Measurements and scale counts of Dryocalamus philippinus Griffin.*

| No. | Sex or age. | Locality.            | Collector.         | Length. | Tail. | Ventrals. |
|-----|-------------|----------------------|--------------------|---------|-------|-----------|
|     |             |                      |                    | mm.     | mm.   |           |
| 419 | ♀           | Iwahig, Palawan..... | L. E. Griffin..... | 485     | 115   | 225       |
| 420 | yg          | .....do.....         | W. Schultze.....   | 241     | 57    | 216       |
| 240 | ♂           | Balabac.....         | C. M. Weber.....   | 375     | 88    | 216       |

| No. | Sub-caudals. | Labials. |        |            |                     | Preoculars. | Postoculars. | Collection.        |
|-----|--------------|----------|--------|------------|---------------------|-------------|--------------|--------------------|
|     |              | Upper.   | Lower. | Enter eye. | Touch chin shields. |             |              |                    |
| 419 | 96           | 7        | 7-8    | 3, 4       | 4                   | 1           | 3            | Bureau of Science. |
| 420 | 99           | 7        | 7      | 3, 4       | 4                   | 1           | 2-3          | Do.                |
| 240 | 87           | 7        | 7      | 3, 4       | 4                   | 0           | 3            | E. H. Taylor.      |

The known range of the ventrals is 216 to 225; of the subcaudals, 87 to 99. The specimen from Balabac has no preocular (being fused with the supraocular), but a preocular is present in both the type and the second Palawan specimen. The type has only 2 postoculars on the left side and 3 on the right. Three is the normal number of postoculars.

*Remarks.*—This species, as has been remarked by Griffin, is related to *Dryocalamus tristrigatus* Günther, and strongly resembles it in color and markings. The apical pits in the scales are absent in this species; the postoculars are three instead of two; and a preocular is normally present. Griffin remarks as follows on the dentition in the type:

Maxillary teeth 8; the last two considerably larger than the others, compressed toward their points, and separated from the first six by a short space. The anterior mandibular teeth are slightly longer than the posterior. There is one distinct tooth-like knob on the basisphenoid.

The species is known only from Palawan and Balabac. It is not poisonous.

#### Genus ZAOCYS Cope

*Coryphodon*, part., GÜNTHER Cat. Col. Snakes Brit. Mus. (1858) 107; JAN, Elenco Sist. Ofid. (1863) 63.

*Zaocys* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 563; GÜNTHER, Rept. Brit. India (1864) 255; BOETTGER, Ber. Senck. Nat. Ges. (1886) 108; BOULENGER, Fauna Brit. India, Rept. (1890) 329; Cat. Snakes Brit. Mus. 1 (1893) 374; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 428.

*Herpetodryas*, part., JAN, Elenco Sist. Ofid. (1863) 80.

*Zapyrus* GÜNTHER, Rept. Brit. India (1864) 256.

“Maxillary teeth 20 to 33, increasing in size posteriorly; mandibular teeth subequal. Head elongate, distinct from neck; eye large, with round pupil; a subocular beneath the præocular. Body elongate, a little compressed; scales smooth or keeled, with apical pits, in 14, 16, or 18 rows; ventrals rounded. Tail long; subcaudals in two rows.” (*Boulenger.*)

Two species occur in the Philippines.

#### *Key to the Philippine species of Zaocys Cope.*

- $\alpha^1$ . Scales smooth, in 14 rows..... *Z. luzonensis* Günther (p. 135).
- $\alpha^2$ . Scales keeled on 2 or 4 middle rows; scales in 16 to 18 rows.  
*Z. carinatus* Günther (p. 136).

*Zaocys luzonensis* Günther is known only from the type and two other specimens; *Z. carinatus* is found in the Philippines only in Palawan and appears to be confined to that island, where it is not rare.

Casto de Elera includes *Coryphodon fuscus*? (= *Zacys fuscus*) from Borongan, Samar; also under the same genus, *Coryphodon*, he lists *C. mucosus* (= *Ptyas mucosus*) Linnæus from Bataan, Luzon, *C. Korros* (= *Ptyas korras*) Reinwardt from Manila, and *C. hexanotus* (= *Xenelaphis hexagonotus*) Cantor from the Calamianes. It is highly probable that these records are erroneous.

#### ZACYS LUZONENSIS Günther

PLATE 12, FIGS. 1 AND 3; PLATE 13, FIGS. 1 AND 2

*Zacys luzonensis* GÜNTHER, Proc. Zool. Soc. London (1873) 169; BOETTGER, Ber. Senck. Nat. Ges. (1886) 108; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 377, pl. 26, fig. 2; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 259.

*Description of species.*—"Rostral as deep as broad, visible from above; internasals shorter than the præfrontals; frontal once and one third as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal at least twice as long as deep; one præocular, with a subocular below it; two postoculars; temporals 2 + 2; eight upper labials, fourth and fifth entering the eye; five lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales smooth, in 14 rows. Ventrals 205; anal divided; subcaudals 119. Pale olive-brown above, the scales edged with black; lower parts yellow, turning to dark olive posteriorly." (*Boulenger.*)

*Measurements of Zacys luzonensis Günther.*

|               | mm.   |
|---------------|-------|
| Total length  | 2,500 |
| Snout to vent | 1,850 |
| Tail          | 650   |

*Remarks.*—The type in the British Museum is a male from Luzon, collected by A. B. Meyer; the exact locality is no longer known. A specimen from Leyte is reported by Boettger.\*

The species is represented in the Bureau of Science collection by the head of a specimen (Plate 13, figs. 1, 2) captured at Sarai, Paete, Laguna Province, Luzon, by R. C. McGregor. According to field notes the specimen measured 2.24 meters. The following are the characters of the head scales: Rostral narrowly visible above, one-fifth wider than high; internasals broader than long; prefrontals very much broader than deep; frontal little longer than its distance from rostral, one-fourth longer than wide, a little shorter than parietal, as long as but

\* Ber. Senck. Nat. Ges. (1890) lxiii.

much wider than supraocular; parietals longer than wide, the part bending down behind eye ending in a sharp point, touching only anterior postocular; posterior nasal higher than interior but less broad; loreal rectangular, twice as long as high; 2 preoculars, superior widely separated from frontal, scarcely visible above, five or six times as large as the inferior; 2 postoculars, superior largest; 2 elongate anterior temporals placed diagonally, both touching inferior postocular; 2 posterior temporals; 8 upper labials, fourth and fifth entering orbit (the 2 scales partially fused on the left side); 10 lower labials, 5 touching anterior pair of chin shields, which are less than two-thirds as long as posterior; posterior chin shields in contact for half their length, touching 3 lower labials; scales with apical pits, in 16 rows around neck (at a point 2 centimeters behind parietals); eye large, its diameter equal to its distance from nostril; a distinct depression across the head in the anterior parietal region.

*Measurements of Zaocys luzonensis* Günther.

|                           | mm.   |
|---------------------------|-------|
| Total length <sup>a</sup> | 2,240 |
| Length of head            | 47    |
| Width of head             | 28    |
| Depth of head at eye      | 16    |
| Length of snout from eye  | 13    |
| Diameter of eye           | 9     |

<sup>a</sup> From field notes of Mr. McGregor.

**ZAOCYS CARINATUS** Günther

PLATE 12, FIGS. 2 AND 4

*Coryphodon carinatus*, part., GÜNTHER, Cat. Col. Snakes Brit. Mus. (1858) 112.

*Zaocys carinatus* GÜNTHER, Rept. Brit. India (1864) 256; BOULENGER, Cat. Snakes Brit. Mus. 1 (1893) 377, pl. 27, fig. 1; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 259; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 115.

*Ptyas korros*, part., BLANFORD, Proc. Zool. Soc. London (1881) 221.

*Description of species*.—(From No. 1342, Bureau of Science collection; collected at Iwahig, Palawan, March, 1911, by C. H. Lamb.) Head elongate, distinct from neck; rostral about one and one-fifth as wide as deep, narrowly visible from above, its suture with nasals longer than sutures with internasals; latter wider than long, a little more than one-third the size of prefrontals and widely separated from loreal; prefrontals about as long as wide, in contact laterally with both loreals; frontal a little longer than wide, wider than supraoculars but shorter, its length equal to its distance from rostral; parietals longer than wide, only a little longer than frontal; nostril between 2 nasals;

2 loreals, the anterior largest and in contact with upper preocular; 2 preoculars, the upper very large, the lower very small; 2 postoculars; 2 anterior temporals (the posterior temporals are fused with the lower anterior; normally  $2 + 2$ ); 9 upper labials, fifth and sixth entering eye; 9 lower labials, 5 touching anterior chin shields; anterior chin shields shorter and narrower than posterior; scales with apical pits (those on body with 2, those on neck with 3 or more pits); scales in 16 rows on body, 20 rows about neck, the 2 median dorsal rows strongly keeled, commencing back some distance on neck and continuing a short distance on tail; on latter half of body the scale rows bordering the median rows are also keeled, and immediately above anus all the scale rows are strongly keeled; ventrals, 207; anal divided; subcaudals, 108 (extreme tip of tail missing); eye large, equal to its distance from anterior part of nostril.

*Color in alcohol.*—Above dark olive gray anteriorly, netted over with whitish yellow, the network formed by the yellow edges of the two vertical scale rows, and the yellowish skin between them (the yellow color scarcely observable, unless the skin is distended) forming alternating scale rows with black edges and black skin between them; posteriorly the ground color becomes a lighter olive brown, and the yellowish network more pronounced and denser; the black color on latter part of body forms irregularly edged longitudinal lines, three on each side; that on the outer row of scales is most pronounced, its zigzag edges extending to ventrals; ventral scales on anterior part of body yellowish; posteriorly also yellowish, with dark spots or dim lines, a pronounced median zigzag line on ventral surface of tail; tail, above with each scale heavily edged with black, and with a circular, light yellow, central area.

*Measurements of Zaocys carinatus Günther.*

|               | mm.   |
|---------------|-------|
| Total length  | 2,340 |
| Snout to vent | 1,782 |
| Tail          | 558   |
| Head length   | 51    |
| Head width    | 28    |

*Variation.*—A second specimen in the Bureau of Science collection, also from Palawan, has only the 2 median scale rows keeled; there are 3 loreals instead of 2, the 2 posterior being superimposed; the temporals are normal. The recorded range of ventrals for extra-Philippine specimens\* is 208 to 215; of

\* Boulenger, loc. cit.

subcaudals, 110 to 118; the range of ventrals is extended somewhat by the scale count of the described specimen. The scale rows, 16 or 18 on middle of body.

*Remarks.*—This species has only recently been found in Palawan and was first reported by Griffin. This is the only Philippine island where it has been found and there it is said to be common. It grows to a length of more than 3 meters. Superficially it resembles *Naja hannah* Cantor in both size and markings. It is harmless. It is also known from Java, Sumatra, Borneo, and the Malay Peninsula.

TABLE 24.—Measurements and scale counts of *Zaocys carinatus* Günther.

| No.  | Sex. | Locality.       | Collector. | Length. | Tail. |
|------|------|-----------------|------------|---------|-------|
| 1342 | ♀    | Iwahig, Palawan | C. H. Lamb | mm.     | mm.   |
| 1340 | ♂    | do              | do         | 2340    | 558   |
|      |      |                 |            | 1830    | 465   |

| No.  | Ventrals. | Subcaudals. | Labials. |        | Scale rows. |       | Collection.        |
|------|-----------|-------------|----------|--------|-------------|-------|--------------------|
|      |           |             | Upper.   | Lower. | Neck.       | Body. |                    |
| 1342 | 207       | 108         | 9        | 9      | 20          | 16    | Bureau of Science. |
| 1340 | 204       | 114         | 9        | 9      | 20          | 16    | Do.                |

### Genus *HOLARCHUS* \* Cope

*Coronella*, part., SCHLEGEL, Phys. Serp. 2 (1837) 50.

*Xenodon*, part., SCHLEGEL, Serp. 2 (1837) 80.

*Simotes*, part., DUMÉRIL and BIBRON, Mém. Ac. Sci. 23 (1853) 472; Erp. Gén. 7 (1854) 624; GÜNTHER, Cat. Col. Snakes (1858) 23.

*Simotes* JAN, Arch. Zool. Anat. Phys. 2 (1863) 232; GÜNTHER, Rept. Brit. India (1864) 212; BOETTGER, Ber. Senck. Nat. Ges. (1886) 107; BOULENGER, Fauna Brit. India, Rept. (1890) 309; Cat. Snakes Brit. Mus. 2 (1894) 214; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 427.

*Holarchus* COPE, Proc. Am. Philos. Soc. 23 (1886) 488; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 353; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 259; TAYLOR, Philip. Journ. Sci. § D 13 (1918) 359.

*Dicraulax* COPE, Am. Nat. (1893) 480.

\* Stejneger says: "The generic name *Simotes*, by which the snakes of this genus have long been designated is preoccupied by *Simotes* of Fischer for a group of mammals as early as 1817. It has consequently to be replaced. Cope proposed *Holarchus*, in 1887, as a term for those species of the genus which have an undivided anal. It is not believed that this character alone, which moreover is not always constant, is sufficient ground for a division of the genus, and as *Holarchus* is the name next in date after *Simotes* it must stand for the combined genus."

"Maxillary teeth 8 to 12, posterior very strongly enlarged and compressed; mandibular teeth subequal. Head short, not distinct from neck; eye rather small, with round pupil; rostral large. Body cylindrical; scales smooth or feebly keeled, in 13 to 21 rows, with or without apical pits; ventrals rounded or obtusely keeled laterally. Tail short or moderate; subcaudals in two rows." (*Boulenger.*)

The species of this genus are distributed through southern Asia, China, Japan, the Malay Peninsula, Sumatra, Java, Borneo, and the Philippines. Four species enter our territory.

Much confusion has resulted from a study of Philippine specimens, particularly *Holarchus ancorus*, which appears to have been described from an anomalous specimen.

*Key to the Philippine species of Holarchus Cope.*

*a*<sup>1</sup>. Anal entire.

*b*<sup>1</sup>. Third and fourth labials entering eye.

*c*<sup>1</sup>. Loreal as long as deep; brown with a pink medial longitudinal line, and an indistinct lateral line; a row of dim black spots on second scale row; below bright rose.

*H. meyerinkii* (Steindachner) (p. 139).

*c*<sup>2</sup>. Loreal longer than deep; pale brownish to lavender with 19 transverse dark spots; below yellow to bright pink.

*H. ancorus* (Girard) (p. 140).

*b*<sup>2</sup>. Fourth labial entering eye; loreal absent; pale lavender with 22 or 23 dark blackish brown dorsal blotches; yellowish below with black spots on ventrals..... *H. maculatus* Taylor (p. 143).

*a*<sup>2</sup>. Anal divided; fourth labial entering eye; loreal present, little longer than wide; dark purplish brown with a dull salmon streak dorsally; 22 narrow transverse dark blotches..... *H. burksi* Taylor (p. 145).

**HOLARCHUS MEYERINKII (Steindachner)**

PLATE 14; PLATE 17, FIGS. 6 AND 7

*Simotes meyerinkii* STEINDACHNER, Sitzb. Ak. Wien (1891) 294.

*Holarchus meyerinkii*, TAYLOR, Philip. Journ. Sci. § D 13 (1918) 360.

*Simotes octolineatus* BOULENGER var. c., Cat. Snakes Brit. Mus. 2 (1894) 224.

*Description of species.*—(From No. 188, Bureau of Science collection; collected at Papahag, Sulu Archipelago, October 14, 1917, by E. H. Taylor.) Rostral broader than deep, the portion seen from above a little more than half its distance from frontal; internasals much smaller than prefrontals, the suture between them little less than that between prefrontals; latter broader than long, touching only posterior part of nasal; frontal much longer than wide, longer than its distance from end of snout, longer and wider than supraocular and longer than parietals; latter longer than broad, bordered by 2 temporals, and touching

1 postocular; nasal partially divided, longer than deep; a small square loreal; preocular twice as long as wide; 2 postoculars, upper nearly twice as large as lower; temporals 2 + 2, only first upper touching postoculars; 6 upper labials, third and fourth entering eye, fifth and sixth rather narrowly in contact; mental small; 7 lower labials (6 on right side), first 4 bordering first pair of chin shields (3 on right side); second pair of chin shields about half as large as first pair; scales in 17 rows; 162 ventrals, rather angulate; subcaudals, 43; eye moderate, its diameter equal to its distance from anterior part of nostril.

*Color in life.*—Above reddish brown, with a median, salmon-pink, longitudinal stripe covering one whole scale row, and two half scale rows; each scale of median row with a darker center; laterally a dim, grayish, longitudinal stripe; on second outer row of scales a series of dark dots; a series of dim dark spots on outer edge of ventrals; head darker brown, with elongate black spots on frontal and on inner part of parietals; a black stripe runs diagonally from neck to parietal; a dark spot below eye; belly bright, immaculate, rosy pink.

*Measurements of Holarchus meyerinkii (Steindachner).*

|                | mm. |
|----------------|-----|
| Total length   | 305 |
| Snout to vent  | 257 |
| Tail           | 48  |
| Length of head | 13  |
| Width of head  | 9   |

*Remarks.*—This species appears to be confined to the Sulu Archipelago; the only definite records are Tawitawi and Bongao Islands. These two records seem to be the only ones other than the types which are labeled Sulu Islands with no definite localities named. This species is separated from *Holarchus octolineatus* \* on the basis of its distinctive coloration and the much smaller number of ventral and subcaudal scales.

**HOLARCHUS ANCORUS (Girard)**

PLATE 17, FIGS. 1 AND 2; PLATE 18, FIG. 3

*Xenodon ancorus* GIRARD, Proc. Acad. Nat. Sci. Philadelphia (1857) 182; U. S. Expl. Exped., Herp. (1858) 167.

*Simotes purpurascens* GÜNTHER, Cat. Col. Snakes (1858) 25; PETERS, Mon. Berl. Ak. (1861) 684.

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\* Barbour, Mem. Mus. Comp. Zool. Harv. 44 (1912) 118, states: "*H. Meyerinkii* (Steind.) was doubtless evolved by isolation from specimens of this species [*H. octolineatus*] probably derived from Borneo.

*Simotes phænochalinus* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 244; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 225; BOETTGER, Ber. Senck. Nat. Ges. (1886) 107; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 80; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 427.

*Simotes aphanospilus* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 245; BOETTGER, Ber. Senck. Nat. Ges. (1886) 107.

*Simotes ancoralis* JAN, Arch. Zool. Anat. Phys. 2 (1863) 233; Icon. Gén. 11 (1865) pl. 4, fig. 2; STEINDACHNER, Novara, Rept. (1867) 61; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 14.

*Holarchus phænochalinus* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 259.

*Holarchus ancorus* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 361.

*Description of species.*—(From No. R 429, E. H. Taylor collection; collected in Manila, June 15, 1915, by E. H. Taylor.) (Adult male.) Rostral large, much higher than wide; portion of rostral seen above nearly equal to its distance from frontal, sharply pointed behind; internasals small, wider than deep, their mutual suture shortest; their longest suture with prefrontal; latter nearly twice as wide as deep, the suture between them somewhat longer than that between internasals; frontal much wider in front than behind, longer than its distance from end of snout, little longer than wide, twice the width of supraocular; parietals scarcely longer than wide, equal to or a little longer than frontal; nasal partially divided, the anterior part largest; loreal longer than wide; 1 preocular; 2 postoculars; supraocular twice as long as wide; temporals 1 + 2; 7 upper labials, third and fourth entering eye; 7 or 8 lower labials, first 4 in contact with first pair of chin shields; mental small, wider than deep, not in contact with anterior chin shields, which are one and a half times the length of posterior; scales in 17 smooth rows with no apical pits; eye large, equal to its distance from nostril; ventrals, 163; anal single; subcaudals, 42; eye less than its distance from nostril.

*Color in life.*—Brownish lavender above with a series of eighteen large, dark, purplish spots edged with black, each extending across back to first or second row of scales; below immaculate cream yellow; subcaudals with dull brown spots; a large anchor-shaped, black-edged spot on nape of neck and another on head, the front of which forms a band that crosses head and eyes diagonally and includes fifth and sixth labials; the main branch of anchor, which runs back medially, increases in width toward neck where it bifurcates, sending a branch to each side of neck; a diagonal temporal streak present; traces of a yellowish vertebral streak visible.

*Measurements of Holarchus ancorus (Girard).*

|                |     |
|----------------|-----|
|                | mm. |
| Total length   | 551 |
| Snout to vent  | 459 |
| Tail           | 92  |
| Width of head  | 14  |
| Length of head | 17  |

*Variation.*—There seems to be much variation in this species, as the attached table shows. The only definite localities given are on Luzon, and it is highly probable that specimens without locality marks are also from that island. The ventrals vary between 149 and 165, the subcaudals, between 34 and 43. The temporals vary equally between 1 + 2 and 2 + 2. One specimen (No. 1554, Bureau of Science collection) has only a single labial (the third) entering the eye; however, there is an obvious fusion of the third and fourth labials. In No. 700, Bureau of Science collection, the anchor-shaped marking is disconnected on the frontal, thus following the marking in *H. burksi*. In all the specimens save the one described there are indications of narrow bands between the larger dark bands; they are usually represented by a few irregular dots across the body or merely by lateral dots. No variations are noted in the number of preoculars, postoculars, anals, or loreals.

TABLE 25.—*Measurements and scale counts of Holarchus ancorus (Girard).*

| No.  | Sex or age. | Locality.     | Length. | Tail. | Ventrals. | Subcaudals. |
|------|-------------|---------------|---------|-------|-----------|-------------|
|      |             |               | mm.     | mm.   |           |             |
| 613  | yg          | Manila.....   | 220     | 26    | 160       | 34          |
| 700  | yg          | Benguet.....  | 280     | 45    | 164       | 43          |
| 752  | ♂           | Unknown.....  | 545     | 85    | 165       | 40          |
| 820  | ♀           | Zambales..... | 475     | 65    | 163       | 37          |
| 910  | ♂           | Bataan.....   | 515     | 85    | 163       | 42          |
| 1554 | ♂           | Unknown.....  | 498     | 87    | 149       | 43          |
| 429  | ♂           | Manila.....   | 551     | 92    | 163       | 42          |

| No.  | Upper labials. | Lower labials. | Labials entering eye. | Scale rows. | Temporals. | Collection.        |
|------|----------------|----------------|-----------------------|-------------|------------|--------------------|
| 613  | 7              | 8              | 3, 4.....             | 17          | 1+2        | Bureau of Science. |
| 700  | 7              | 8              | 3, 4.....             | 17          | 2+2        | Do.                |
| 752  | 7              | 7              | 3, 4.....             | 17          | 2+2        | Do.                |
| 820  | 7-8            | 7              | 3, 4.....             | 17          | 2+2        | Do.                |
| 910  | 7              | 7              | {4, 5.....            | 17          | 1+2        | Do.                |
|      |                |                | {3, 4.....            | 17          | 2+2        | Do.                |
| 1554 | 6              | 7              | 3.....                | 17          | 1+2        | Do.                |
| 429  | 7              | 8              | 3, 4.....             | 17          | 1+2        | E. H. Taylor.      |

*Remarks.*—Boulenger \* has placed *Xenodon ancorus* Girard as a questioned synonym of this species. The differences are obvious. In *X. ancorus* there are two preoculars (the lower one very small) and there are eight upper labials, the fourth and fifth entering the eye. It is highly probable that this is merely a variation from the normal, as it otherwise agrees with the normal form. In one of the specimens (No. 910, Bureau of Science collection) we have the increased number of labials on one side, and the fourth and fifth labials entering the eye.

It is probably confined to the Philippines. The reference of specimens to Java is probably erroneous. The species is small, and absolutely harmless. It appears very gentle when handled. This species is not rare in Luzon.

## HOLARCHUS MACULATUS Taylor

## PLATE 15

*Holarchus maculatus* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 364, pl. 1.

*Description of species.*—(From the type, No. 40, E. H. Taylor collection; collected at Bunawan, Agusan, August, 1912, by E. H. Taylor.) Rostral moderate, higher than wide; portion visible above less than half its distance from rostral; suture between internasals as large as or larger than prefrontal suture; prefrontals much larger than internasals, in contact laterally with 2 labials; frontal hexagonal in shape, its length equal to parietals, a little longer than its distance from end of snout; parietals small, as wide as long; nasal not or at least only partially divided; nostril pierced near posterior margin; no loreal present; 2 small preoculars, upper twice as large as lower; supraocular not twice as long as wide; 2 postoculars; temporals 1 + 2 (on left side 1 + 1); 7 upper labials, only fourth entering eye; labials in the following order of size: sixth, fourth, fifth, seventh, third, second, first; mental small, twice as wide as deep; 7 lower labials, 3 touching first pair of chin shields, which are larger than second pair; eye equal to its distance from nostril or minutely less; scales smooth, in 17 rows; ventrals, 164; anal single; subcaudals double, 54 in number.

*Color in life.*—Above pale lavender, with a series of twenty-three broad blackish brown dorsal spots extending laterally to ventrals; dorsally the spots are seven or eight scales wide, but narrowed laterally to a width of one or two scales; the spots are edged with narrow whitish lines; the nuchal band runs forward

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\* Cat. Snakes Brit. Mus. 2 (1894) 225.

and stops with a blunt point on frontal scale; a narrow band crosses head anteriorly and includes eyes; a dark blotch on temporals, which is connected with this band; small spots on nasals; chin yellow; on edges of half of the ventrals are small spots, which involve one or two of the body scales; on each alternate ventral are two larger rectangular spots; throat variously spotted with dark; ventral surface yellow; below tail yellowish with very few spots or none.

*Measurements of Holarchus maculatus Taylor.*

|                |      |
|----------------|------|
| Total length   | mm.  |
| Snout to vent  | 299  |
| Tail           | 240  |
| Length of head | 59   |
| Width of head  | 14   |
|                | 10.5 |

*Variation.*—A second specimen taken at the same locality (No. 41, E. H. Taylor collection) is very different in the scalation of the head, but it seems to be an abnormal specimen. A small loreal is present on the right side of the head, and the two preoculars are fused into one, on the left side. The first lower labial on both sides is broken in two, making it appear that there is a pair of minute chin shields behind the mental. The temporal elements on the right side are not normal, the parietal is broken, and there are two anterior temporals. In coloration and marking it is practically identical with the type. Both this and the type specimen are from Bunawan, Agusan. I collected them from under piles of sod and trash.

This form is obviously different from other Philippine species. The markings are distinctive. The loreal is absent, and only a single labial enters the eye; two preoculars are present. These characters, together with many minor differences, separate it from *H. meyerinkii* and *H. ancorus*. From *H. burksi* it is separated by markings and coloration and the above-mentioned characters, save that of the single labial entering the eye, on which the two forms agree.

TABLE 26.—*Measurements and scale counts of Holarchus maculatus Taylor.*

| No. | Locality.       | Length. | Tail. | Ventrals. | Subcaudals. | Upper labials. | Lower labials. | Preoculars. | Postoculars. | Loreals. | Labials enter eye. | Scale rows. | Temporals.   | Collection.   |
|-----|-----------------|---------|-------|-----------|-------------|----------------|----------------|-------------|--------------|----------|--------------------|-------------|--|---------------|
|     |                 | mm.     | mm.   |           |             |                |                |             |              |          |                    |             |  |               |
| 40  | Bunawan, Agusan | 299     | 59    | 164       | 54          | 7              | 7              | 2           | 2            | 0        | 1                  | 17          | $\begin{smallmatrix} 2+3 \\ 1+3 \end{smallmatrix}$ | E. H. Taylor. |
| 41  | do              | 258     | 50    | 162       | 54          | 7              | 7              | 2-1         | 2            | 1-0      | 1                  | 17          | $\begin{smallmatrix} 2+3 \\ 1+3 \end{smallmatrix}$ | Do.           |

## HOLARCHUS BURKSI Taylor

## PLATE 16

*Holarchus burksi* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 365, pl. 2.

*Description of type*.—(No. 200, E. H. Taylor collection; collected at Sumagui, Mindoro, December, 1916, by Clark Burks.) Head rather distinct from neck; rostral high, bending back over snout, pointed behind; internasals narrowed on inner side, much wider than long, the suture between them much less than prefrontal suture; prefrontals somewhat rectangular, almost twice as wide as long; frontal shield-shaped, much longer than its distance from end of snout, equal to parietal in length, not twice as broad as supraocular but of nearly equal length; parietals as broad as long, bordered by 2 temporals; nasal undivided, the anterior portion much the higher; loreal large, longer than wide; a single elongate preocular, widely separated from frontal; 2 subequal postoculars; temporals 1 + 2; 7 upper labials, fourth alone entering eye; upper margin of labial series very much broken; 7 lower labials, 4 touching the large chin shields; second pair of chin shields about half the size of first pair; scales in 17 rows, smooth; the smallest scales are the dorsal, of angular shape; laterally, the scales are larger and rounding; ventrals, 154; anal divided; subcaudals, 32.

*Color in life*.—Above grayish brown, becoming more gray laterally, with a median, dorsal salmon-pink streak going the length of body; body traversed by twenty saddlelike blotches which widen medially to the width of three scales and narrow greatly laterally, usually to the width of one scale; the blotches are black, inclosing a gray spot dorsally, the entire blotch edged with a narrow grayish white line, less apparent medially; between each two blotches laterally there is a series of two or three small, elongate, white-edged, dark spots, each smaller than a scale; neck with a forked blotch, each leg of which begins laterally at the seventh ventral and extends upward and forward where the two meet medially, some distance behind parietals, and run forward much narrowed to the middle of frontal; a dark broad line below eye, which is more or less continuous with a band crossing snout on or about the anterior level of eyes; a diagonal line beginning on second ventral runs up to parietals; a spot below nostril and another on sixth labial; two or three spots on lower labials; four ventrals on neck with spots; ventrally, an immaculate, brilliant, rosy pink, almost red toward end of body.

*Measurements of Holarchus burksi Taylor.*

|                | mm. |
|----------------|-----|
| Total length   | 381 |
| Snout to vent  | 334 |
| Tail           | 47  |
| Width of head  | 11  |
| Length of head | 13  |

*Remarks.*—In markings this species much resembles the Philippine *Holarchus ancorus*, but is well differentiated by having the single labial entering the eye, the undivided nasal, and the divided anal. It agrees with *H. woodmasoni* and *H. maculatus* in having a single labial entering the eye; the differences from the latter are pointed out under the discussion of that species; from the former it differs by a very much reduced number of subcaudals and ventrals and the undivided anal; the coloration also is totally different. Its closest affinity seems to be with *H. beddomii*, which also has an undivided nasal and a divided anal. This species differs in having the fourth and fifth labials entering the eye. The markings and coloration are also quite different. The species is named for Mr. Clark Burks, who collected the unique specimen and presented it to me.

## Genus OLIGODON Boie

*Oligodon* BOIE, Isis (1827) 519; WAGLER, Syst. Amph. (1830) 191; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 54; GÜNTHER, Cat. Col. Snakes (1858) 20; Rept. Brit. India (1864) 205; JAN, Arch. Zool. Anat. Phys. 2 (1862) 36; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; BOULENGER, Fauna Brit. India, Rept. (1890) 317; Cat. Snakes Brit. Mus. 2 (1894) 233; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 426.

*Calamaria*, part., SCHLEGEL, Phys. Serp. 2 (1837) 25.

*Homalosoma*, part., JAN, Arch. Zool. Anat. Phys. 2 (1862) 33.

*Rhynchocalamus* GÜNTHER, Proc. Zool. Soc. London (1864) 491.

*Tripeltis* COPE, Proc. Am. Philos. Soc. 23 (1886) 487.

Maxillary teeth, 6 to 8; the posterior somewhat enlarged and compressed; no pterygoid teeth, the palate being without teeth or with 2 or 3 on each palatine; head short and not or but slightly distinct from neck; eye small, pupil round; body cylindrical; scales in 15 or 17 rows; anal single or double; nasal single or double.

This genus is closely related to *Holarchus*, there being no sharp dividing line between them.

*Oligodon* is a genus with a large number of species distributed from northeastern Africa, through southern Asia, and the Malay Archipelago. Four species have been described from the Philippines.

*Key to the Philippine species of Oligodon Boie.\**

*a*<sup>1</sup>. Scales in 15 rows; anal entire.

*b*<sup>1</sup>. One postocular.

*c*<sup>1</sup>. No loreal; dark brown with a yellowish vertebral streak; below yellowish with large, rectangular, black spots; chevron-shaped bands on head. Southern Negros.... *O. modestus* Günther (p. 147).

*c*<sup>2</sup>. A small loreal; dark purplish brown above with yellow dots and a series of 18 large, rhomboidal, brownish yellow, black-edged spots; yellowish below. Mindanao and Balabac.

*O. notospilus* Günther (p. 148).

*b*<sup>2</sup>. Two postoculars; loreal present; dark purplish brown above with 11 small, dark red, dark-edged rhomboidal spots along back; ventral surface rose red. Palawan..... *O. iwahigensis* Griffin (p. 149).

*a*<sup>2</sup>. Scales in 15 rows; anal divided; dark gray above, with a series of small white spots with black edges on back; orange beneath. Busuanga..... *O. schadenbergi* Boettger (p. 151).

All of these species are small and appear to be very rare, as only one or two specimens of each have been collected.

## OLIGODON MODESTUS Günther

## PLATE 13, FIGS. 3 TO 5

*Oligodon modestus* GÜNTHER, Rept. Brit. India (1864) 210; Proc. Zool. Soc. London (1879) 77; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 238, pl. 10, fig. 3; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 426; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 260; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359.

*Description of species.*—(From Boulenger.) “Nasal divided; portion of rostral seen from above as long as its distance from the frontal; suture between the internasals a little shorter than that between the præfrontals; frontal longer than its distance from the end of the snout, as long as the parietals; no loreal; one præ- and one postocular; temporals 1 + 2 or 1 + 3; six upper labials, third largest and entering the eye; three or four lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 15 rows. Ventrals 158–170; anal entire; subcaudals 41. Dark brown above, with a yellowish vertebral streak; a yellowish chevron-shaped band on the occiput; lower parts yellowish, with quadrangular black spots.”

*Measurements of Oligodon modestus Günther.*

|               | mm. |
|---------------|-----|
| Total length  | 350 |
| Snout to vent | 295 |
| Tail          | 55  |

\*Casto de Elera lists *O. sublineatus* Günther as occurring in Samar. This is probably erroneous.

*Remarks.*—The type, collected by H. Cuming, is reported from "Philippine Islands;" the exact locality is no longer known. A specimen is recorded from southern Negros, taken by A. Everett. Both these specimens are males. I failed to find this species in my collecting in central and northern Negros; if it occurs there, it is probably very rare.

OLIGODON NOTOSPILUS Günther

PLATE 7, FIG. 2; PLATE 17, FIGS. 3 TO 5; PLATE 18, FIG. 1

*Oligodon notospilus* GÜNTHER, Proc. Zool. Soc. London (1873) 169, pl. 18, fig. A; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 239; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 426; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 260.

*Description of species.*—(From No. 242, E. H. Taylor collection; collected at Balabac, 1916, by C. M. Weber.) (Adult female.) Head not or but slightly distinct from neck, with snout moderately blunt; rostral high, bent over snout, portion visible above shorter than its distance from frontal; internasals four-sided, narrowed medially, the sutures with prefrontals and nasals largest, the suture with the latter slightly smaller than that with the former but much larger than the sutures with rostral; prefrontals about twice as large as internasals, extending laterally to below level of middle of eye; suture between prefrontals little larger than that between internasals; sutures formed with frontal and internasals largest, subequal; frontal distinctly longer than its distance from end of snout, a little longer than wide, two to two and a half times as wide as supraocular, but little shorter than parietals; latter about as broad as long, narrowly separated from fifth labial, bordered by 2 temporals and a postparietal scale larger than body scales; nasal apparently divided; loreal small, distinctly longer than wide; a single preocular larger than loreal; supraocular elongate, about twice as long as wide, more than half the length of frontal; rather large postocular; temporals 1 + 2, set diagonally; 7 upper labials, third and fourth entering eye; 8 lower labials, 4 touching first pair of chin shields, which are larger than second pair; scales in 15 rows; ventrals, 139; anal single; subcaudals, 35.

*Color in alcohol.*—Dark purplish brown above with numerous yellow spots, suggesting a reticulated pattern, and a series of eighteen median, rhomboidal, yellowish brown spots with blackish edges; head yellowish brown with two chevron-shaped dark bands, the anterior including the eyes; the second band

risers from fourth ventral, passes across angle of jaw, and ends in a point on frontal; behind this is a similar chevron-shaped band of yellowish brown reaching frontal; a few irregular blotches on labials and throat; belly yellowish.

*Measurements of Oligodon notospilus Günther.*

|                | mm. |
|----------------|-----|
| Total length   | 345 |
| Snout to vent  | 292 |
| Tail           | 53  |
| Width of head  | 10  |
| Length of head | 13  |

*Remarks.*—This species has been known only from the type since its discovery about 1870 in Mindanao. The specimen here described agrees remarkably well with the type description. In coloration and markings it is identical with the description and the plate. The variation in the ventral count is only four; the subcaudal count is identical. In the specimen at hand the subcaudals are all divided, and there are four instead of three lower labials touching the first pair of chin shields.

OLIGODON IWAHIGENSIS Griffin

PLATE 18, FIG. 2

*Oligodon iwahigensis* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 598; § D 6 (1911) 260.

*Description of species.*—(From the type specimen, No. R 10, Bureau of Science collection; collected at Iwahig, Palawan, by W. Schultze.) Maxillary teeth 6, 2 teeth on each palatine; head not or scarcely distinct from neck, much narrowed on snout; rostral about as high as wide, well visible from above, pointed behind; sutures with anterior nasal largest, the portion of rostral seen from above shorter than its distance from snout; internasals about half as large as prefrontals, their shortest sides joining, the suture between them equal or nearly equal to that between prefrontals; latter wider than deep, the suture with frontal largest, that with loreal smallest; frontal but little longer than wide, almost a regular hexagon, more than twice as wide as supraoculars and longer, its length greater than its distance from end of snout; parietals longer than frontal, in contact with 1 postocular, much narrowed behind; nostril between 2 nasals, the anterior largest, both touching first labial; loreal small, little more than half the size of preocular; 1 preocular, higher than wide; 2 postoculars, the upper largest; temporals  $1 + \frac{1}{2}$ , the anterior in contact with the 2 postoculars; 7 upper labials, third and fourth entering

eye, sixth largest, first smallest; 7 lower labials, first 4 in contact with anterior chin shields, which are much larger than second pair; mental wider than deep, separated from first pair of chin shields; scales smooth, rounded, in 15 rows; no apical pits evident; 139 ventrals; subcaudals, 36; anal entire; tail ending in a sharp point, slender.

*Color*.—Dark purplish brown above with eleven small, light brown, rhomboidal spots along back; lateral scales finely flecked with white dots; occasional, larger white spots present; upper surface of head gray-brown, with a chevron-shaped, brown band passing through eyes, rather dim between eyes; a second chevron-shaped, dark-brown band on neck, its point nearly confluent with middle of first band; behind this a similar stripe of lighter brown, wider on side than medially; a dark spot on sixth upper labial and another on fourth and fifth lower labials; two distinct spots on anterior chin shields; chin with various small spots; throat with a large blotch confluent with the chevron-shaped neck band; remainder of ventral surface uniform coral red (cream color in alcohol). The body coloration extends slightly on the ventral scales.

*Measurements of Oligodon iwahigensis Griffin.*

|                | mm.  |
|----------------|------|
| Total length   | 324  |
| Snout to vent  | 267  |
| Tail           | 57   |
| Width of head  | 8.5  |
| Length of head | 12.5 |

*Variation*.—No variation in scalation is observable save that in No. R 923 the anal is divided. Both specimens have a small scale inserted between the last ventral and the anal. The coloration and marking are the same.

*Remarks*.—I am not yet fully convinced as to the distinctness of this species from *O. schadenbergi*. The latter species is described as follows: "Anal divided—dark gray above with white black-edged spots,—orange below," whereas the present species has the anal entire and is purplish brown above with small, red, black-edged spots, and rose below. However the color of the type of *O. iwahigensis* easily fits the color scheme of *O. schadenbergi* since it has been preserved in alcohol. The anal character would separate them, were it constant; but the fact that, of the two specimens of *O. iwahigensis* examined, one has the anal single and the other double, leads me to suspect that the two forms may be the same, and that one or the other

of the types is anomalous with respect to that character. This question will not be satisfactorily settled until the types, or a series of specimens from both type localities, can be compared. From *O. notospilus* it differs in coloration and markings, the former having eighteen instead of eleven spots.

TABLE 27.—Measurements and scale counts of *Oligodon iwahigensis* Griffin.

| No.               | Locality.            | Collector.        | Length. | Tail. |
|-------------------|----------------------|-------------------|---------|-------|
|                   |                      |                   | mm.     | mm.   |
| R 16, type .....  | Iwahig, Palawan..... | W. Schultze ..... | 324     | 57    |
| R 923, type ..... | do .....             | C. H. Lamb .....  | 330     | 60    |

| No.               | Ventrals. | Subcaudals. | Anal. | Scale rows. | Postoculars. | Collection.        |
|-------------------|-----------|-------------|-------|-------------|--------------|--------------------|
| R 16, type .....  | 139       | 36          | 1     | 15          | 2            | Bureau of Science. |
| R 923, type ..... | 142       | 36          | 2     | 15          | 2            | Do.                |

#### OLIGODON SCHADENBERGI Boettger

*Oligodon schadenbergi* BOETTGER, Abh. Mus. Dresden 7 (1894-95) 4;  
GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 260.

*Description of species.*—(After the type description.) From *Oligodon vertebralis* Günther, of South Borneo, it is distinguished by a shorter, blunter head; by a frontal two and a half to three times as wide as the supraocular; by a smaller loreal; and by the internasal suture which is distinctly shorter than the prefrontal suture; the ventral counts are smaller (145-147 as against 154) and the subcaudals are fewer (39 as against 54). Head short, snout blunt; nasal large, divided; part of rostral visible above about as long as prefrontal suture; internasal suture considerably shorter than prefrontal suture; frontal somewhat longer than its distance from end of snout, somewhat shorter than parietals, broadly hexangular, at least two and a half times wider than supraocular; a small trapezoidal loreal; 1 preocular, and 2 postoculars; 7 upper labials, third and fourth entering eye; 4 lower labials touching first chin shields, which are almost twice the length of second; scales in 15 rows; ventrals, 145 to 147; anal divided; subcaudals, 38 or 39.

*Color.*—Above dark gray strongly contrasted with the orange-colored underside; marked as *Oligodon bitorquatus* Boie, with very small, black-edged spots in a netlike pattern; head yellowish brown with two broad crossbands (as in *O. vertebralis* Günther);

a spot under nostril; edges of lower jaw and throat with larger blotches of darker; under tail brick red; sometimes with a median series of larger, white, black-edged dots.

*Remarks.*—The types consist of two adults and a half-grown specimen from Busuanga. I failed to obtain specimens of this rare snake during my recent visit to Busuanga. Only the types are known.

### Genus GONYOSOMA Wagler

*Gonyosoma* WAGLER, Icon. Amph. (1828) Nat. Syst. Amph. (1830) 184; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 213; GÜNTHER, Cat. Col. Snakes (1858) 122; Rept. Brit. India (1864) 293; BOETTGER, Ber. Senck. Nat. Ges. (1886) 110; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 432.

*Coluber*, part., BOIE, Isis (1827) 537; BOULENGER, Fauna Brit. India, Rept. (1890) 330; SCLATER, Journ. As. Soc. Bengal 60 (1891) 239; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 24.

*Herpetodryas*, part., SCHLEGEL, Phys. Serp. 2 (1837) 189; CANTOR, Cat. Mal. Rept. (1847) 80.

*Tyria* FITZINGER, Neue Class. Rept. (1843) 60.

Body compressed; ventrals more than 200, slightly keeled, turning up on sides; snout subacuminate; teeth smooth, equal in length; 1 preocular, 2 postoculars; eye small, pupil round; head shields regular; head slender, distinct from neck; scales smooth or feebly keeled; scales in 23 to 27 rows; tail long; subcaudals double.

The genus is not a large one and has frequently been regarded as belonging to the genus *Elaphe*. This association however is not warranted. One species,\* *Gonyosoma oxycephalum* (Boie), enters the Philippines. The snakes of this species are arboreal in habit and feed largely on small mammals and birds. Günther † states that they are of fierce disposition, and that in order to strike, they raise the anterior third of the body from the ground. They are harmless to man.

### GONYOSOMA OXYCEPHALUM (Boie)

*Coluber oxycephalus* BOIE, Isis (1827); BOULENGER, Fauna Brit. India, Rept. (1890) 335; SCLATER, Journ. As. Soc. Bengal 60 (1891) 239; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 56.

*Gonyosoma viride* WAGLER, Icon. Amph. (1828) pl. 9.

*Herpetodryas oxycephalus* SCHLEGEL, Phys. Serp. 2 (1837) 189, pl. 7, figs. 8 and 9; Abbild. (1844) pl. 44, figs. 1–9; CANTOR, Cat. Mal. Rept. (1847) 80.

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\* Casto de Elera's record of *Gonyosoma frenatum* Gray is very probably erroneous, as that species is confined to India.

† Rept. Brit. India (1864) 294.

*Alopecophis chalybeus* GRAY, Ann. & Mag. Nat. Hist. II 4 (1849) 247.

*Gonyosoma oxycephalum* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 213; GÜNTHER, Cat. Col. Snakes (1858) 122; Rept. Brit. India (1864) 294; PETERS, Mon. Berl. Ak. (1861) 688; JAN, Icon. Gén. (1869) 31, pl. 1; STOLICZKA, Journ. As. Soc. Bengal 39 (1870), 193; 42 (1873) 123; THEOBALD, Cat. Rept. Brit. India (1876) 189; BOETTGER, Ber. Senck. Nat. Ges. (1886) 110; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 432; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 116; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359.

*Elaphe oxycephala* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 597; § D 6 (1911) 260.

*Description of species.*—(From No. 231, Bureau of Science collection; collected at Iwahig, Palawan, October, 1910, by C. H. Lamb.) Body slender, elongate, compressed; tail elongate, slender; head narrow, subacuminate, slightly distinct from neck; rostral about one-third broader than high, visible above, its suture with nasal nearly double that with internasals or first labials; internasals as wide as deep, their mutual suture equal to that with prefrontals, a little longer than wide, five-sided, bending low on side of head, broadly in contact with loreal and preocular; frontal large, equal to its distance from rostral, about one-eighth longer than wide, in contact with preocular, much longer and wider than supraoculars; parietals longer than wide, larger than frontal, bending down on sides of head, touching only upper postoculars; nasal divided, the anterior part largest; loreal nearly three times as long as wide, touching 3 labials; preocular three times the size of loreal, touching 3 labials and frontal; 2 postoculars, the superior more than twice as large as the inferior; 2 anterior temporals, the lower barely in contact with lower preocular, the upper touching both; temporal formula,  $2 + 3 + 3$ ; 9 upper labials, anterior ones higher than wide, sixth and seventh entering orbit, ninth and eighth largest; 13 lower labials, 5 pairs in contact with anterior chin shields, which are about three times as large as posterior; eye small, its diameter contained in length of snout about three times; 30 scale rows on neck, 25 rows around body, smooth anteriorly but more or less distinctly keeled on latter half of body; scales sharp-pointed posteriorly, the median row not enlarged, the outer slightly so; ventrals, 246; anal divided; subcaudals, 133, in double rows; ventrals and subcaudals slightly keeled, the edges bending up on sides, slightly notched at bend.

*Color in life.*—Above bright yellowish to whitish green, growing more yellowish green on sides; anterior part of scales, and skin between scales, tinged with bluish slate or cream yellow; skin, when distended, shows dim diagonal bars of darker and lighter color; head olive, labials greenish, tail yellowish drab to flesh color, anterior part of scales with dim dark edge; below more yellowish than on sides, inner sutures of subcaudals edged with darker; chin, throat, and belly cream yellow; outer edges of ventrals greenish.

*Measurements of Gonyosoma oxycephalum (Boie).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,965 |
| Snout to vent  | 1,480 |
| Tail           | 485   |
| Length of head | 52    |
| Width of head  | 27    |

*Variation.*—Philippine specimens examined have the following variations in scale counts: Ventrals, 240 to 253; subcaudals, 122 to 135; upper labials, 8 to 11; and lower labials, 12 to 15. One specimen (No. 415, Bureau of Science collection) has the right internasal and the two right nasals fused into a single scale. No. 327 (E. H. Taylor collection) has the head blackish with a longitudinal dark line on side of head, and with much dark color on body scales.

Boulenger\* gives the variation in scale counts as follows: Ventrals, 233 to 263; subcaudals, 122 to 149; 9 to 11 upper labials, 2, rarely 3, entering eye; scales in 23 to 27 rows around body. His specimen "g" from the Philippines (exact locality unknown) has 27 scale rows. The largest specimen he lists measures 2,300 millimeters in length; the tail, 480.

*Remarks.*—This large arboreal snake probably attains a length of 2.5 meters. It is not rare in the Philippines, but is confined largely to forested or mountainous districts. Specimens I have observed in a wild state were usually coiled about branches of trees. One young specimen captured was coiled under a small fallen log. In the Philippines it has been taken in Luzon (several localities), Palawan, Balabac, and Negros. It probably occurs in all of the larger islands. It is also known from Tenasserim, Malay Peninsula, Java, Borneo, and the Natuna Islands. The snake is not poisonous.

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\* Cat. Snakes Brit. Mus. 2 (1894) 57.

TABLE 28.—Measurements and scale counts of *Gonyosoma oxycephalum* (Boie).

| No.  | Locality.              | Collector.        | Sex or age. | Length. | Tail. | Ventrals. | Subcaudals. |
|------|------------------------|-------------------|-------------|---------|-------|-----------|-------------|
|      |                        |                   |             | mm.     | mm.   |           |             |
| 229  | Iwahig, Palawan.....   | C. M. Weber.....  | ♂           | 1435    | 325   | 253       | 127         |
| 230  | do.....                | C. H. Lamb.....   | ♀           | 1815    | 460   | 246       | 133         |
| 231  | do.....                | do.....           | ♀           | 1965    | 485   | 246       | 133         |
| 415  | do.....                | C. M. Weber.....  | ♂           | 1530    | 375   | 240       | 135         |
| 327  | Balabac.....           | do.....           | ♂           | 1155    | 260   | 247       | 122         |
| 1100 | Los Baños, Laguna..... | E. H. Taylor..... | yg          | 450     | 80    | 245       | (*)         |

| No.  | Anals. | Labials. |        |            |                     | Scale rows. |       | Collection.        |
|------|--------|----------|--------|------------|---------------------|-------------|-------|--------------------|
|      |        | Upper.   | Lower. | Enter eye. | Touch chin shields. | Neck.       | Body. |                    |
| 229  | 2      | 9        | 14     | 6, 7       | 6                   | 31          | 25    | Bureau of Science. |
| 230  | 2      | 10-11    | 14     | 6, 7       | 6                   | 31          | 25    | Do.                |
| 231  | 2      | 9        | 13     | 6, 7       | 6                   | 30          | 25    | Do.                |
| 415  | 2      | 9        | 15     | 6, 7       | 6                   | 29          | 25    | Do.                |
| 327  | 2      | 9        | 14     | 6, 7       | 6                   | 29          | 25    | E. H. Taylor.      |
| 1100 | 2      | 8-9      | 12     | 5, 6       | 6                   | 29          | 25    | Do.                |

\* Mutilated.

## Genus ELAPHE Fitzinger

*Coluber* BOIE, Isis (1826) 209; GÜNTHER, Rept. Brit. India (1864) 237; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 24.

*Elaphe* FITZINGER, in Wagler's Descr. et Icon. Amphib. 3 (1833) pl. 27; STEJNEGER, Bull. U. S. Nat. Mus. 53 (1907) 307.

*Plagiodon* DUMÉRIL and BIBRON, Mem. Ac. Sci. 23 (1853) 447; Erp. Gén. 7 (1854) 170.

*Elaphis* BONAPARTE, Mem. Acad. Sci. Torino II 2 (1840) 402.

*Composoma* (non Serv.) DUMÉRIL and BIBRON, Mem. Ac. Sci. 23 (1853) 453; Erp. Gén. 7 (1854) 291; GÜNTHER, Rept. Brit. India (1864) 243.

The name *Elaphe* must stand for this genus as is shown by Stejneger; and *Coluber*,\* the usually accepted name, must be used for the genus of poisonous vipers, usually known as *Vipera*.

Two fairly well-defined species of this genus are found in the Philippines.

*Key to the Philippine species of Elaphe Fitzinger.*

a<sup>1</sup>. Ventrals, 216 to 233; subcaudals, 87 to 100; markings on head and neck wanting or indistinct; young, with narrow dim whitish transverse white bars..... *E. erythrura* (Duméril and Bibron) (p. 156).

a<sup>2</sup>. Ventrals, 223 to 238; subcaudals, 103 to 110; markings on head and neck distinct; young, brown with black transverse bars inclosing light spots  
*E. philippina* Griffin (p. 159).

\* Bull. U. S. Nat. Mus. 53 (1907) 443.

## ELAPHE ERYTHRURA (Duméril and Bibron)

- Plagiodon erythrurus* DUMÉRIL and BIBRON, *Erp. Gén.* 7 (1854) 175; PETERS, *Mon. Berl. Ak.* (1861) 684; JAN, *Elenco Sist. Ofid. Milan* (1863) 61; *Icon. Gén.* (1867) 21, pl. 4, fig. 2; STEINDACHNER, *Sitzb. Ak. Wien. c. 1* (1891) 141.
- Composoma melanurum* var. DUMÉRIL and BIBRON, *Erp. Gén.* 7 (1854) 301; GÜNTHER, *Proc. Zool. Soc. London* (1873) 169; MÜLLER, III. *Nacht. Cat. Herp. Samml. Basel Mus.* (1883) 14 (var.); FISCHER, *Jahrb. wiss. Anst. Hamburg* 2 (1885) 80 and 101 var.
- Elaphis subradiatus*, part., GÜNTHER, *Cat. Col. Snakes* (1858) 95.
- Spilotes melanurus*, part., GÜNTHER, *Cat. Col. Snakes* (1858) 97.
- Elaphis melanurus* var. *manillensis* JAN, *Icon. Gén.* 21 (1867) pl. 4, fig. 2.
- Elaphe melanurum* var. *celebensis* JAN, *Icon. Gén.* 21 (1867) pl. 5, fig. 2.
- Composoma melanurum* var. *erythrurum* FISCHER, *Jahrb. wiss. Anst. Hamburg* 2 (1885) 101; BOETTGER, *Ber. Senck. Nat. Ges.* (1886) 108 (var. *erythrura*).
- Elaphe erythrura* GRIFFIN, *Philip. Journ. Sci.* § D 5 (1910) 213; § D 6 (1911) 260; TAYLOR, *Philip. Journ. Sci.* § D 12 (1917) 359.

*Description of species.*—(From No. 69, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, July 15, 1913, by E. H. Taylor.) (Adult male.) Rostral higher than wide, visible above, forming its longest suture with anterior nasal; its sutures with prefrontals and labials subequal; suture between internasals short, less than length of internasal scale, and contained in prefrontal suture two and a half times; internasal broader than long, bordering edge of nostril; prefrontals more than twice as long as internasals, the suture formed with the latter and that with frontal subequal, its shortest suture with posterior nasal; frontal longer than broad, its length equal to its distance from end of snout, much wider than supraoculars; parietals narrow, longer than frontal; 2 nasals, posterior highest; loreal diagonal, longer than high; prefrontal very large, visible from above, separated from frontal, in contact with third and fourth labials; 2 postoculars, upper largest; temporals 2 + 2; 9 upper labials, fourth, fifth, and sixth entering eye; 11 lower labials, 5 touching anterior chin shields, which are shorter and broader than posterior; scales in 23 rows about neck, 21 rows about body, all except outer row keeled; ventrals, 221; anal single; subcaudals, 100.

*Color in life.*—Anterior half of body drab to brownish olive above, lighter on sides, two indistinct yellowish bands on neck and a series of small indistinct spots along edge of ventrals of neck; top of head dark olive; latter part of body dark with an irregular mixture of reddish scales; tail reddish salmon.

The transitions in color are gradual. Anterior half of belly immaculate brown-yellow, edges of ventrals having the lateral body color; ventrals on latter part of belly spotted irregularly with dark gray to black; tail immaculate below.

*Measurements of Elaphe erythrura (Duméril and Bibron).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,080 |
| Snout to vent  | 815   |
| Tail           | 265   |
| Length of head | 30    |
| Width of head  | 17.5  |

*Variation.*—Three other specimens from the same immediate locality as the one described agree very well in scalation; the ventrals range between 217 and 225; the subcaudals, from 96 to 100; there are 6 lower labials touching the anterior chin shields. There is some inconsequent variation of the dorsal coloration.

Negros specimens are very different from the described specimen in coloration; the entire posterior part of the body is dark bluish black, and the ventrals of the posterior part of the body and the subcaudals are grayish black. The scale formulæ are practically identical with those of the Luzon and Mindanao forms; otherwise they would merit subspecific distinction. The young of Negros specimens are dark brown anteriorly with narrow, transverse, lighter areas on the skin between the scales; along the middle part of the body the light color forms a network; the tail is black, and the outer side of the posterior part of the body is drab.

Specimens from Luzon are uniform brown to reddish olive, the edges of the scales usually slightly darker, and the tail usually a lighter reddish brown; below the belly is immaculate yellowish; young Luzon specimens are a uniform brown, or are traversed by numerous very narrow, dim, whitish bars, the white being chiefly confined to the skin between the scales. Sometimes a dim dark spot is visible below, and another behind the eye; the inside of the throat is black.

One Polillo specimen resembles the specimens from Negros in having the posterior part of the body dark.

*Remarks.*—This common species is abundant wherever found. It is known from Mindanao, Luzon, Negros, Polillo, and Mindoro. Boulenger\* and Griffin report the species from Palawan, but I regard this as doubtful. The species is also known from

\* Boulenger's record, Ann. & Mag. Nat. Hist. VI 14 (1894) 82, very probably refers to *E. philippina* Griffin.

Celebes. The species feeds on mammals and birds and is harmless to man.

TABLE 29.—Measurements and scale counts of *Elaphe erythrura* (Duméril and Bibron).

| No. | Locality.                    | Collector.    | Sex. | Length.<br>mm. | Tail.<br>mm. | Ventrals. | Subcaudals. |
|-----|------------------------------|---------------|------|----------------|--------------|-----------|-------------|
| 276 | Dumaguete, Occidental Negros | Eskridge      | ♀    | 1,550          | 333          | 226       | 97          |
| 277 | Cadiz, Occidental Negros     | A. Celestino  | ♂    | 1,295          | 298          | 222       | 97          |
| 278 | Victorias, Occidental Negros | H. M. Curran  | ♀    | 1,490          | 320          | 226       | 96          |
| 279 | Polillo                      | C. Canonizado | ♀    | 1,410          | 290          | 231       | * 86        |
| 175 | Occidental Negros            | E. H. Taylor  | ♀    | 1,330          | 282          | 224       | * 98        |
| 178 | do                           | do            | ♂    | 1,410          | 290          | 218       | (b)         |
| 179 | do                           | do            | ♂    | 1,340          | 318          | 216       | 99          |
| 282 | Manila                       | L. E. Griffin | ♂    | 1,400          | (b)          | 210       | * 92        |
| 284 | do                           | do            | ♂    | 1,150          | 255          | 222       | 92          |
| 285 | do                           | do            | ♂    | 1,470          | 305          | 215       | * 88        |
| 286 | do                           | E. H. Taylor  | ♀    | 1,285          | 260          | 225       | 90          |
| 287 | do                           | do            | ♂    | 1,310          | (b)          | 218       | * 83        |
| 288 | do                           | do            | ♂    | 1,560          | 340          | 224       | 94          |
| 289 | Ifugao, Luzon                | H. O. Beyer   | ♂    | 1,480          | 300          | 218       | 89          |
| 66  | Bunawan, Agusan              | E. H. Taylor  | ♂    | 1,222          | 270          | 225       | 97          |
| 67  | do                           | do            | ♂    | 1,340          | (b)          | 222       | (b)         |
| 68  | do                           | do            | ♂    | 1,370          | 310          | 217       | 96          |
| 69  | do                           | do            | ♂    | 1,180          | 265          | 221       | 100         |

| No. | Scale rows. |       | Labials.   |        |        |                     | Temporals. | Collection.        |
|-----|-------------|-------|------------|--------|--------|---------------------|------------|--------------------|
|     | Neck.       | Body. | Enter eye. | Upper. | Lower. | Touch chin shields. |            |                    |
| 276 | 23          | 21    | 4, 5, 6    | 9      | 10     | 5                   | 2+2        | Bureau of Science. |
| 277 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 278 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 279 | 23          | 21    | 4, 5, 6    | 9      | 11-12  | 6-5                 | 2+2        | Do.                |
| 175 | 23          | 21    | 4, 5, 6    | 9      | 11-10  | 5                   | 2+2        | E. H. Taylor.      |
| 178 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 179 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 282 | 23          | 21    | 4, 5, 6    | 9      | 10     | 5                   | 2+2        | Bureau of Science. |
| 284 | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 285 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 286 | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 287 | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 288 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 289 | 23          | 21    | 4, 5, 6    | 9-8    | 11     | 5                   | 2+2        | Do.                |
| 66  | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | E. H. Taylor.      |
| 67  | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |
| 68  | 23          | 21    | 4, 5, 6    | 9      | 10-11  | 6                   | 2+2        | Do.                |
| 69  | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Do.                |

<sup>a</sup> Tip of tail missing.

<sup>b</sup> Mutilated.

## ELAPHE PHILIPPINA Griffin

*Elaphe philippina* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 597; § D 6 (1911) 260.

*Elaphe erythrura* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 260.

*Description of species.\**—(From No. 291, Bureau of Science collection; collected at Iwahig, Palawan, February, 1909, by C. M. Weber.) Head elongate, rather slender; rostral strongly visible above; internasals a little broader than deep, bordering nostril above, forming a longer suture with anterior nasal than with posterior; prefrontals nearly three times the size of internasals, in contact with supraoculars; frontal longer than wide, scarcely as long as its distance from end of snout, as long as supraoculars, distinctly shorter than parietals; parietals much longer than broad, in contact with 2 temporals and both postoculars; 2 nasals; loreal as long as high; a single large preocular; 2 postoculars; temporals 2 + 2, the 2 anterior in contact with sixth labial, neither touching superior postocular, and only upper anterior temporal touching inferior postocular; 9 upper labials, fourth, fifth, and sixth entering orbit, seventh, eighth, and ninth largest; 11 lower labials, 5 touching anterior chin shields, which are broader but shorter than posterior pair; latter pair barely in contact anteriorly, bordering labials their entire length; scales forming straight longitudinal rows, the 8 median rows keeled on anterior part of body, about 12 keeled rows on posterior part of body; scales with apical pits in 23 rows around neck, and 21 on body; scales on body rounded anteriorly and pointed behind; ventrals obtusely keeled laterally, not notched, 236; anal undivided; subcaudals divided, 104. †

*Color in alcohol.*—Above brown with the larger part of the scales dimly dark edged, and light areas on skin between scales; anterior part of body and neck with black crossbars, inclosing yellowish spots laterally; these become dimmer posteriorly; about twelve can be distinguished. Head brown above; upper labials yellowish; a black spot below eye; a distinct diagonal black line from eye to mouth, reaching ninth labial; a distinct diagonal stripe from posterior temporals across angle of jaws to ventrals, reaching tenth ventral; belly and underside of tail yellowish, the vertical part of ventrals gray.

\* Griffin had five specimens before him, no particular one of which was designated as the type. The specimen here described is No. 17 of the type series.

† Griffin gives 94, which is incorrect.

*Measurements of Elaphe philippina Griffin.*

|                |       |
|----------------|-------|
|                | mm.   |
| Total length   | 1,420 |
| Snout to vent  | 1,113 |
| Tail           | 307   |
| Length of head | 32    |
| Width of head  | 16    |

*Variation.*—The young differ from the adults in the distinctness of the markings; more than 20 transverse bands are evident, but they do not extend as far back as the tail; posterior fourth of body and the tail uniform brown. The ventrals range between 223 and 242; subcaudals, between 103 and 110.

TABLE 30.—*Measurements and scale counts of Elaphe philippina Griffin.*

| No.  | Locality.       | Collector.    | Sex. | Length. | Tail. | Ventrals. | Subcaudals. |
|------|-----------------|---------------|------|---------|-------|-----------|-------------|
|      |                 |               |      | mm.     | mm.   |           |             |
| 5114 | Balabac         | C. M. Weber   | ♀    | 1,885   | 300   | 236       | 103         |
| 5115 | do              | do            | ♀    | 1,465   | 315   | 238       | 108         |
| 290  | Iwahig, Palawan | do            | ♀    | 1,410   | 320   | 232       | 107         |
| 291  | do              | do            | ♀    | 1,420   | 307   | 236       | 104         |
| 292  | do              | do            | ♀    | 1,360   | 310   | 234       | 110         |
| 293  | do              | do            | ♀    | 1,290   | 295   | 236       | 105         |
| 294  | Taytay, Palawan | L. E. Griffin | ♂    | 1,380   | (a)   | 230       | (a)         |
| 295  | Iwahig, Palawan | C. H. Lamb    | ♂    | 1,495   | (a)   | 233       | (a)         |
| 297  | do              | do            | ♀    | 1,225   | 276   | 242       | 106         |
| 298  | do              | do            | ♂    | 1,160   | 265   | 238       | 107         |
|      | Bongao          | E. H. Taylor  | ♂    | 1,360   | 340   | 223       | 107         |
|      | do              | do            | ♂    | 720     | (a)   | 236       | (a)         |

| No.  | Scale rows. |       | Labials.   |        |        |                     | Temporals. | Collection.        |
|------|-------------|-------|------------|--------|--------|---------------------|------------|--------------------|
|      | Neck.       | Body. | Enter eye. | Upper. | Lower. | Touch chin shields. |            |                    |
| 5114 | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | E. H. Taylor.      |
| 5115 | 23          | 21    | 4, 5, 6    | 9      | 11     | 6-5                 | 2+2        | Do.                |
| 290  | 23          | 21    | 4, 5, 6    | 9      | 11     | 6                   | 2+2        | Bureau of Science. |
| 291  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 292  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 293  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 294  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 295  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 297  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
| 298  | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
|      | 23          | 21    | 4, 5, 6    | 9      | 11     | 5                   | 2+2        | Do.                |
|      | 23          | 21    | 4, 5, 6    | 9      | 11-12  | 5-6                 | 2+2        | Do.                |

\* Mutilated.

*Remarks.*—The species differs from *Elaphe erythrura* Duméril and Bibron in a higher average of ventrals and subcaudals; the average for *E. philippina* is about 235 for ventrals, and 106 for subcaudals; while in *E. erythrura* ventrals average 221 and subcaudals 93. The markings are distinctive, as shown by Griffin; the head is slenderer in *E. philippina*. The types are from Palawan. Specimens have since been taken in Busuanga, Balabac, and Bongao. The species feeds largely on birds and small mammals. It probably never eats reptiles or amphibians. It is absolutely harmless to man.

### Genus LIOPELTIS Fitzinger

- Coronella*, part., SCHLEGEL, Phys. Serp. 2 (1837) 50.  
*Herpetodryas*, part., SCHLEGEL, Phys. Serp. 2 (1837) 173.  
*Liopeltis* FITZINGER, Syst. Rept. (1843) 26; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 337.  
*Ablabes*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 304; GÜNTHER, Cat. Col. Snakes (1858) 27; Rept. Brit. India (1864) 223.  
*Cyclophis*, part., GÜNTHER, Cat. Col. Snakes (1858) 119; Rept. Brit. India (1864) 229.  
*Eurypholis* HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia (1860) 493 and 559; JAN, Elenco Sist. Ofid. (1863) 81.  
*Phragmitophis* GÜNTHER, Ann. & Mag. Nat. Hist. III 9 (1862) 126.  
*Homalosoma*, part., JAN, Arch. Zool. Anat. Phys. 2 (1862) 33.  
*Liopeltis*, part., COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 559; JAN, Elenco Sist. Ofid. (1863) 81.  
*Diadophis*, part., JAN, Elenco Sist. Ofid. (1863) 261.  
*Ablabes* BOULENGER, Fauna Brit. India, Rept. (1890) 304; Cat. Snakes Brit. Mus. 2 (1894) 277.  
*Entacanthus* COPE, Rep. U. S. Nat. Mus. (1898) 780.

"Maxillary teeth small, equal, 15 to 30; mandibular teeth subequal. Head not or scarcely distinct from neck; eye rather small or moderate, with round pupil; loreal present or absent; nasal entire or divided. Body cylindrical, usually slender; scales smooth or feebly keeled, without apical pits, in 13 to 17 rows; ventrals not angulate\* laterally. Tail moderate or long; subcaudals in two rows." (From Boulenger's description of *Ablabes*.)

The snakes belonging to this genus are distributed over southern and eastern Asia, Japan, Malay Peninsula, and the East Indies. Two species enter the Philippines. One is the widely distributed *Liopeltis tricolor* (Schlegel); the other, *Liopeltis philippinus* (Boettger), is probably endemic.

\* Slightly angulate in certain species.—E. H. T.

The snakes are small, probably neither species attaining a length of more than two-thirds of a meter. They are probably arboreal in habit. Both species appear to be rare in the Philippines. They are absolutely harmless and are very gentle when handled.

*Key to the Philippine species of Liopeltis Fitzinger.*

- $\alpha^1$ . Nostril between nasal and internasal, which are completely fused in front of nostril; light brown above with four dark brown, longitudinal lines; yellowish below..... *L. philippinus* (Boettger) (p. 164).  
 $\alpha^2$ . Nostril in single nasal, completely separated from internasal; olive to light brown above; a black streak behind eye, and a light stripe on outer row of scales..... *L. tricolor* (Schlegel) (p. 162).

**LIOPELTIS TRICOLOR (Schlegel)**

PLATE 11, FIGS. 3 TO 5; PLATE 19

*Herpetodryas tricolor* SCHLEGEL, Phys. Serp. 2 (1837) 187, pl. 6, figs. 16-18.

*Cyclophis tricolor* GÜNTHER, Cat. Col. Snakes (1858) 121; Proc. Zool. Soc. London (1872) 590; STOLICZKA, Journ. As. Soc. Bengal 42 (1873) 122.

*Liopeltis tricolor* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 559; JAN, Icon. Gén. (1869) 31, pl. 6, fig. 2.

*Ablabes tricolor* BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 281; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 599; § D 6 (1911) 261; TAYLOR, Philip. Journ. Sci. § D 13 (1918) 260.

*Description of species.*—(From No. 709, Bureau of Science collection; collected at Iwahig, Palawan, March, 1909, by W. Schultze.) (Adult male.) Head elongate, depressed, its height less than three times diameter of eye; rostral broader than deep, small, well visible above, the suture with nasal largest, sutures with internasals and with first labials coequal; internasals rather triangular, pointed anteriorly, longest along their mutual suture, which is about equal to that between prefrontals, not as long as that with nasals; prefrontals rather large, broader than deep, in contact with 1 or 2 labials, nasal, and preocular, their median suture rather diagonal, leaving left prefrontal, forming a considerable suture with right internasal; frontal elongate, scarcely, if any broader than supraocular, twice as long as wide, slightly longer than its distance to end of snout; parietals elongate, not twice as long as wide, in contact with 2 postoculars; nasal elongate, single, separating internasals from labials; nostril pierced in posterior part; no loreal; a single small preocular; supraoculars twice as long as wide; 2 postoculars, coequal, and nearly equal in size to preocular; temporals 1+2, large, elongate, both upper temporals bordering parietals their entire length; 8

upper labials, seventh largest, fourth and fifth entering eye; 8 lower labials, 4 touching anterior chin shields which are slightly longer than, but almost equal in size to, posterior; scales in 15 rows, smooth, without apical pits; ventrals, 149, slightly angulate laterally; subcaudals, 116; anal divided.

*Color in life.*—Grayish to olive brown above, anterior third of body and head rather more olive; a black streak begins on rostral, passes through eye and continues along neck and sides some distance, growing gradually indistinct; tail above a light reddish to pinkish brown; a pale yellowish to lavender olive streak along outer row of scales and edges of ventral; chin and belly immaculate creamy white.

*Measurements of Liopeltis tricolor (Schlegel).*

|                | mm. |
|----------------|-----|
| Total length   | 502 |
| Snout to vent  | 324 |
| Tail           | 178 |
| Width of head  | 9   |
| Length of head | 18  |

TABLE 31.—*Measurements and scale counts of Liopeltis tricolor (Schlegel).*

| No.  | Locality.       |       | Collector.    |       | Sex. | Length. | Tail. | Ventrals. |
|------|-----------------|-------|---------------|-------|------|---------|-------|-----------|
|      |                 |       |               |       |      | mm.     | mm.   |           |
| 709  | Iwahig, Palawan | ----- | W. Schultze   | ----- | ♂    | 502     | 178   | 149       |
| 723  | do              | ----- | C. M. Weber   | ----- | ♀    | 435     | 165   | 148       |
| 1171 | Taytay, Palawan | ----- | L. E. Griffin | ----- |      | 467     | 181   | 145       |
| 666  | Bubuan, Sulu    | ----- | E. H. Taylor  | ----- |      |         |       | 137       |

| No.  | Sub-caudals. | Anal. | Pre-oculars. | Post-oculars. | Temporals. | Labials entering eye. | Scale rows. | Collection.        |
|------|--------------|-------|--------------|---------------|------------|-----------------------|-------------|--------------------|
| 709  | 116          | 2     | 1            | 2             | 1+2        | 4, 5                  | 15          | Bureau of Science. |
| 723  | 124          | 2     | 1            | 2             | 1+2        | 4, 5                  | 15          | Do.                |
| 1171 | 124          | 2     | 1            | 2             | 1+2        | 4, 5                  | 15          | Do.                |
| 666  | * 103        | 2     | 1            | 2             | 1+2        | 4, 5                  | 15          | Do.                |

\* Mutilated.

*Variation.*—Practically no variation of moment is evident in the Philippine specimens; the ventrals vary from 137 to 149; the subcaudals, from 116 to 124. A fourth, badly mutilated specimen in my collection was taken from the stomach of a *Boiga dendrophila* from Palawan. I obtained a specimen of this species on the very small island of Bubuan, Tapian group, Sulu Archipelago, in October, 1917. It was taken in a low tree about 3 meters from the earth; the tip of the tail

is slightly mutilated, only 103 subcaudals showing. The ventrals are 137, a lower number than in the Palawan specimens. Boulenger \* gives the ventral range as 140 to 187; the subcaudal, 103 to 130.

LIOPELTIS PHILIPPINUS (Boettger)

PLATE 20

*Ablabes philippinus* BOETTGER, Zool. Anz. 20 (1897) 164; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 261.

*Description of species.*—(From No. 940, Bureau of Science collection; collected at Iwahig, Palawan, 1908, by C. M. Weber.) (Adult male.) Head distinctly triangular, rather flattened, quite distinct from neck; rostral almost one and a half times as wide as high, but slightly pointed behind; the suture with nasal is twice that with first labial; internasal fused with nasal to form a single scale; nostril pierced near posterior part; a suture issues from nostril and continues back to suture between nasal and prefrontal, partially dividing scale; the combined scale somewhat smaller than prefrontal; latter much broader than deep, in contact with 2 labials laterally and a small preocular posteriorly. (In the specimen here described the prefrontals are fused, with a slight linear depression between them, doubtless an abnormal condition.) The posterior sides are rounding; frontal elongate, twice as long as wide, pointed behind, not twice as wide as supraoculars, but longer; parietals elongate, very much longer than wide, much longer than frontal; loreal wanting; preocular small, square, widely separated from frontal; 2 postoculars, upper a little the larger, both in contact with parietal; temporals 1 + 2, very well defined; 8 upper labials, fourth and fifth entering eye, fifth and sixth touching lower postocular; 8 lower labials, 4 in contact with anterior pair of chin shields, which are little more than half the size of posterior pair; mental as wide as deep, triangular; scales in 15 rows, dorsals smallest, laterals largest, rather rounding behind; 140 ventrals; anal divided; subcaudals, 119. Eye less than its distance from nostril; tail extremely slender near end, terminating in a sharp point; apical pits wanting.

*Color in alcohol.*—Above grayish yellow to light brown; four longitudinal brown stripes begin on neck and continue along body; two median stripes, one and a half scale rows in width, separated by one whole and two half rows of scales; these stripes continue to end of tail; lateral stripes are separated from dorsal by two whole rows of scales and are only the width

\* Catalogue, loc. cit.

of a half scale row; these continue only to near anus; the light areas between the brown lines laterally are punctate with many small brownish dots; head olive, with an indistinct dark line behind eye, this being the origin of the lateral brown line; labials, chin, and throat immaculate; ventrals with small dots on their outer edges and a few scattered larger dots in a median row along middle part of belly; the lateral punctations on subcaudals form an indistinct line.

*Measurements of Liopeltis philippinus (Boettger).*

|                | mm.  |
|----------------|------|
| Total length   | 640  |
| Snout to vent  | 390  |
| Tail           | 250  |
| Length of head | 20   |
| Width of head  | 10.5 |

*Variation.*—Boettger gives the ventral count as 144 to 146; the subcaudal, as 118.

*Remarks.*—No other specimen of this rare snake is at hand for comparison. This one agrees well with the type description. Boettger's two types are from Samar and Culion, collected by Moellendorff and Koch. With so wide a distribution it is striking that so few specimens have reached collections and that it has remained undiscovered until so late a date.

**Genus DENDROPHIS Boie**

*Ahaetulla*, part., GRAY, Ann. Phil. 10 (1825) 208.

*Leptophis*, part., BELL, Zool. Journ. 2 (1825) 328; JAN, Elenco Sist. Ofid. (1863) 84.

*Dendrophis* BOIE, Isis (1827) 520; BOETTGER, Ber. Senck. Nat. Ges. (1886) 111; BOULENGER, Fauna Brit. India, Rept. (1890) 337; Cat. Snakes Brit. Mus. 2 (1894) 77; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 433.

*Dendrophis*, part., WAGLER, Syst. Amph. (1830) 182; SCHLEGEL, Phys. Serp. 2 (1837) 220; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 193; GÜNTHER, Cat. Col. Snakes (1858) 148; Rept. Brit. India (1864) 296; JAN, Elenco Sist. Ofid. (1863) 85.

"Maxillary teeth 20 to 33, the posterior more or less enlarged, stouter if not longer than the rest; anterior mandibular teeth longest. Head distinct from neck, more or less elongate; eye large, with round pupil. Body elongate, more or less compressed; scales smooth, in 13 or 15 rows, narrow, disposed obliquely, with apical pits, those of the vertebral row more or less enlarged; ventrals with a suture-like lateral keel and a notch on each side, corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals." (*Boulenger.*)

Snakes of this genus are distributed over southeastern Asia, Malay Archipelago, to Australia. They are largely arboreal, and are harmless.

Only one species, *Dendrophis pictus* (Gmelin), is known in the Philippines. *Dendrophis punctulata*, an Australian species, has been reported from the Philippines by Günther\* and by Parenti and Picaglia† and is included in Boettger's,‡ Casto de Elera's,§ and Griffin's|| lists. Boulenger has referred Günther's specimen to *Dendrelaphis terrificus* (Peters), and I think without doubt that the specimen reported by Parenti and Picaglia belongs to this species also; or, if correctly identified, that it did not originate in Ticao, Philippines, as stated by Parenti and Picaglia.

#### DENDROPHIS PICTUS (Gmelin)

- Coluber pictus* GMELIN, Syst. Natura 1 (1788) 1116.  
*Coluber decorus* SHAW, Zool. 3 (1802) 538.  
*Dipsas schokari*, part., KÜHL, Beitr. Zool. Verg. Anat. (1820) 80.  
*Ahætulla decorus* GRAY, Ann. Phil. 10 (1825) 208.  
*Leptophis ahætulla*, part., BELL, Zool. Journ. 2 (1825) 328.  
*Dendrophis picta* BOIE, Isis (1827) 530; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 193.  
*Ahætulla belli* GRAY, Ill. Ind. Zool. 2 (1834) pl. 80.  
*Dendrophis pictus*, part., SCHLEGEL, Phys. Serp. 2 (1837) 228, pl. 9, figs. 5-7; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 197; GIRARD, U. S. Expl. Exp. (1858) 129; GÜNTHER, Cat. Col. Snakes (1858) 148; Rept. Brit. India (1864) 297; JAN, Icon. Gén. 32 (1869) pl. 1, fig. 3; THEOBALD, Cat. Rept. Brit. India (1876) 190; BOETTGER, Ber. Senck. Nat. Ges. (1886) 111; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 78; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 433; BARBOUR, Mem. Mus. Comp. Zool. Harv. Coll. 44 (1912) 117.  
*Leptophis pictus* CANTOR, Cat. Mal. Rept. (1847) 82.  
*Ahætulla picta* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 556.  
*Leptophis formosus* JAN, Icon. Gén. (1879) 49, pl. 6, fig. 2.

*Description of species.*—(From No. 219, E. H. Taylor collection; collected in Occidental Negros, August 10, 1915, by E. H. Taylor.) Body slender; tail long and slender, somewhat compressed; head elongate, distinct from neck; rostral broader than high, well visible above; internasals longer than wide, their mutual suture about equal to their suture with prefrontal; prefrontals larger than internasals, wider than deep, bending down over sides of head, forming a long suture with loreal, narrowly in

\* Cat. Col. Snakes Brit. Mus. (1858) 150.

† Atti. Soc. Nat. Modena, Mem. Orig. III 5 (1886) 50.

‡ Ber. Senck. Nat. Ges. (1886) 111.

§ Cat. Fauna Filipinas 1 (1895) 433.

|| Philip. Journ. Sci. § D 6 (1911) 259.

contact with supraocular (on one side only); frontal nearly triangular, rather narrowly pointed behind, longer and wider than supraocular, equal to its distance to end of snout; parietals rather short, in contact with superior postocular; nasal divided, posterior part largest; an elongate loreal, more than twice as long as high; a large preocular, widest at top, in contact with frontal (on one side); 2 postoculars, lower very small. Temporals 1 + 2; 11 upper labials, fourth (very narrowly), fifth, and sixth entering eye, sixth, seventh, and eighth largest; 9 lower labials, 5 in contact with first pair of chin shields, which are broader but very much shorter than second pair; second pair of chin shields separated posteriorly by 2 scales; a single large scale borders last 5 labials; scales in 15 rows, entirely smooth, with apical pits, median row largest, hexagonal; laterals narrow, elongate, broadly imbricate, outer row large, triangular; ventrals, 180, strongly keeled and notched laterally; subcaudals, 148, keeled and notched; anal divided.

*Color in life.*—Above yellow-green; a broad dark stripe begins behind eye, dimly indicated on loreal region, and continues some distance on neck, where it is broken in dark bars separated by bluish diagonal bands; the blue color on scales is usually covered by the overlapping scale, and is not much in evidence until the skin is distended; the markings are not or scarcely evident past the middle of body; outer scale row yellowish; ventrals greenish yellow ventrally, greenish laterally; top of head olive; upper labials, chin, and throat yellow.

*Measurements of Dendrophis pictus (Gmelin).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,145 |
| Snout to vent  | 748   |
| Tail           | 397   |
| Length of head | 26    |
| Width of head  | 14    |

*Variation.*—In Philippine specimens examined the ventrals vary between 163 and 180; the subcaudals, between 139 and 166; the supralabials, between 8 and 11, and the temporals are 1 + 2 or 2 + 2. The fifth and sixth labials usually enter the eye. Boulenger \* gives the range as ventrals, 165 to 190; subcaudals, 122 to 164.

*Remarks.*—This is a common species, widely distributed in the Philippines. I have examined specimens from Luzon, Ne-

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\* Cat. Snakes Brit. Mus. 2 (1894) 79.

gros, Panay, Mindoro, Polillo, Palawan, Busuanga, Mindanao, Lapac, and Cagayan Sulu. It is also reported from Samar.

Outside of the Philippines it occurs over southern Asia, Malay Peninsula, Malay Archipelago to the Moluccas, and New Guinea.

These snakes are usually taken in small bushes or trees. They are arboreal in habit, and feed on lizards and frogs. The species is absolutely harmless. It is confused by many Filipinos with *Dryophis prasinus*, the so-called *dahon palay*, which is regarded by them as deadly poisonous. In Negros I have seen this species handled by schoolboys who do not fear it. It is there called *maninini*.

TABLE 32.—Measurements and scale counts of *Dendrophis pictus* (Gmelin).

| No.  | Locality. | Collector.   | Age or sex. | Length. | Tail. | Ventrals. | Subcaudals. |
|------|-----------|--------------|-------------|---------|-------|-----------|-------------|
|      |           |              |             | mm.     | mm.   |           |             |
| 6    | Mindanao  | E. H. Taylor | yg          | 375     | 136   | 171       | 166         |
| 109  | do        | do           | ♀           | 885     | 302   | 171       | 136         |
| 404  | do        | do           | ♂           | 920     | a 315 | 169       | (a)         |
| 431  | do        | do           | ♂           | 740     | a 253 | 169       | (a)         |
| 435  | do        | do           | ♀           | 648     | 230   | 176       | 153         |
| 444  | do        | do           | yg          | 294     | 98    | 175       | 139         |
| 476  | do        | do           | ♀           | 910     | 326   | 172       | 147         |
| 483  | Negros    | do           | ♂           | 760     | 264   | 181       | 145         |
| 633  | do        | do           | ♂           | 840     | a 264 | 170       | (a)         |
| 651  | do        | do           | ♂           | 795     | 285   | 171       | 151         |
| 1453 | do        | do           | ♂           | 760     | a 240 | 163       | (a)         |
| 219  | do        | do           | ♀           | 1,145   | 397   | 180       | 148         |

| No.  | Preoculars. | Postoculars. | Labials. |        |                     | Temporals. | Scale-rows. | Collection.   |
|------|-------------|--------------|----------|--------|---------------------|------------|-------------|---------------|
|      |             |              | Upper.   | Lower. | Enter eye.          |            |             |               |
| 6    | 1           | 1            | 9        | 10-9   | 5, 6                | 2+2        | 15          | E. H. Taylor. |
| 109  | 1           | 3-2          | 9        | 10     | 5, 6                | 2+2        | 15          | Do.           |
| 404  | 1           | 1            | 8        | 10     | 4, 5                | 2+2        | 15          | Do.           |
| 431  | 1           | 3-2          | 9        | 10     | { 4, 5, 6<br>5, 6 } | 2+2        | 15          | Do.           |
| 435  | 1           | 2            | 9        | 9      | 5, 6                | 1+2        | 15          | Do.           |
| 444  | 1           | 2            | 10       | 10     | 5, 6                | 2+2        | 15          | Do.           |
| 476  | 1           | 2            | 7-9      | 10     | { 4<br>5, 6 }       | 1+2        | 15          | Do.           |
| 483  | 1           | 2            | 9        | 10     | 5, 6                | 1+2        | 15          | Do.           |
| 633  | 1           | 2            | 9        | 10     | 5, 6                | 2+2        | 15          | Do.           |
| 651  | 1           | 2            | 10       | 9      | 5, 6                | 1+2        | 15          | Do.           |
| 1453 | 1           | 2            | 9        | 10     | 5, 6                | 2+2        | 15          | Do.           |
| 219  | 1           | 2            | 11       | 9      | { 4, 5, 6<br>5, 6 } | 1+2        | 15          | Do.           |

a Mutilated.

## Genus DENDRELAPHIS Boulenger

*Leptophis*, part., BELL, Zool. Journ. 2 (1825) 328.

*Dendrophis*, part., WAGLÈR, Syst. Amph. (1830) 182; SCHLEGEL, Phys. Serp. 2 (1837) 220; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 193; GÜNTHER, Cat. Col. Snakes (1858) 148; Rept. Brit. India (1864) 296; JAN, Elenco Sist. Ofid. (1863) 85; BOETTGER, Ber. Senck. Nat. Ges. (1886) 111.

*Dendrelaphis* BOULENGER, Fauna Brit. India, Rept. (1890) 339; Cat. Snakes Brit. Mus. 2 (1894) 87; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 260.

"Maxillary teeth 18 to 23; anterior maxillary and mandibular teeth longest. Head elongate, distinct from neck; eye large, with round pupil. Body much elongate, feebly compressed; scales smooth, in 13 or 15 rows, narrow, disposed obliquely, with apical pits, those of the vertebral row not or but very slightly enlarged; ventrals with a suture-like lateral keel and a notch on each side, corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals." (*Boulenger.*)

The genus is distributed over southern Asia and the East Indies. There are three Philippine species.

Key to the Philippine species of *Dendrelaphis* Boulenger.

$\alpha^1$ . Ventrals,\* 176 to 186; subcaudals, 105 to 113; body with numerous black stripes along entire length. Palawan and Balabac.

*D. caudolineatus* (Gray) (p. 169).

$\alpha^2$ . Ventrals, 169 to 179; subcaudals, 103 to 112; no stripes of any kind on body. Luzon, Mindoro, Negros, and Sulu.

*D. modestus* Boulenger (p. 172).

$\alpha^3$ . Ventrals, 162 to 186; subcaudals, 94 to 112; a black stripe behind eye; stripes wanting on anterior third of body, usually present on posterior part. Luzon, Negros, and Mindanao.... *D. terrificus* (Peters) (p. 174).

## DENDRELAPHIS CAUDOLINEATUS (Gray)

## PLATE 21

*Ahætulla caudolineata* GRAY, Ill. Ind. Zool. 2 (1834) pl. 81.

*Leptophis caudolineatus* CANTOR, Cat. Mal. Rept. (1847) 85.

*Dendrophis octolineata* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 201; JAN, Icon. Gén. (1869) 32, pl. 2, fig. 1.

*Dendrophis caudolineata* GÜNTHER, Cat. Col. Snakes (1858) 150; Rept. Brit. India (1864) 297; GÜNTHER, Zool. Rec. (1870) 75; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 194; 42 (1873) 123.

*Dendrelaphis caudolineatus* BOULENGER, Fauna Brit. India, Rept. (1890) 339; Cat. Snakes Brit. Mus. 2 (1894) 89; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 598; § D 6 (1911) 261.

*Description of species.*—(From No. 414, Bureau of Science collection; collected in Palawan.) Head moderately slender;

\* Counts of ventrals and subcaudals are for Philippine specimens.

eye large, its diameter less than length of snout; rostral broader than deep, the sutures formed with nasal and internasal subequal; internasals a little wider than long, distinctly shorter than prefrontals, and less than half as large; prefrontals somewhat broader than long, broadly in contact with loreal; frontal about one and two-thirds times as long as broad, shorter than parietals; latter one and a half times as long as broad, touching superior postocular and 3 temporals; supraoculars large, about as broad as frontal, in contact with prefrontals; nasal divided, internasal also bordering nostril; loreal two to two and a half times as long as high; preocular large, visible above; 2 postoculars, superior more than twice as large as inferior; 2 small anterior temporals, both in contact with lower postocular; temporal formula,  $2 + 2 + 2$ ; 9 upper labials, fifth and sixth (on right side fourth, fifth, and sixth) entering eye; 10 lower labials, 5 touching anterior chin shields, which are broader and shorter than second pair; latter in contact almost two-thirds of their length; scales in 13 rows, with apical pits, median row scarcely larger than adjoining rows; ventrals, 183, strongly keeled and notched; anal divided; subcaudals, 110, keeled and notched.

*Color in alcohol.*—Black above, each scale marked with a longitudinal bluish green mark which leaves the ground color in longitudinal lines; a black line from eye continues back along body on second and third outer scale rows, but not covering entire scales; below this stripe is a straight-edged yellow stripe, covering lower part of second and upper part of first scale rows; below this yellow stripe, covering lower part of first scale rows, is a black stripe beginning on side of neck and continuing to tip of tail; this stripe is broader than the others on body; four dorsal black stripes, the two median narrowest; these four stripes continue to tail and merge into one; tail has five stripes to near tip, and only three at tip; below on belly immaculate greenish blue; a black median stripe on under side of tail.

*Measurements of Dendrelaphis caudolineatus (Gray).*

|                 | mm.   |
|-----------------|-------|
| Total length    | 1,115 |
| Snout to vent   | 805   |
| Tail            | 310   |
| Length of head  | 30    |
| Width of head   | 14    |
| Diameter of eye | 6     |
| Length of snout | 7.5   |

*Variation.*—Color markings are fairly stable in the specimens of this species taken in the Philippines. The ventrals

vary between 176 and 186; the subcaudals, between 105 and 113; sometimes 3 labials enter the orbit, sometimes 2, both conditions being frequently found in the same specimen. The temporal formula is normally  $2 + 2 + 2$ , but many specimens have the 2 anterior superior temporals coalesced, leaving the formula  $\frac{1}{1+1} + 2$ .

TABLE 33.—Measurements and scale counts of *Dendrelaphis caudolineatus* (Gray).

| No. | Locality.    |  |  |  | Collector.       | Sex. | Length. | Tail. | Ventrals. | Subcaudals. |
|-----|--------------|--|--|--|------------------|------|---------|-------|-----------|-------------|
|     |              |  |  |  |                  |      | mm.     | mm.   |           |             |
| 215 | Palawan..... |  |  |  | C. M. Weber..... | ♂    | 930     | 255   | 176       | 105         |
| 218 | .....do..... |  |  |  | .....do.....     | ♀    | 940     | 265   | 184       | 111         |
| 219 | .....do..... |  |  |  | .....do.....     | ♂    | 346     | 94    | 184       | -----       |
| 222 | .....do..... |  |  |  | .....do.....     | ♀    | 485     | 125   | 183       | * 108       |
| 223 | .....do..... |  |  |  | .....do.....     | ♂    | 715     | 181   | 183       | -----       |
| 224 | .....do..... |  |  |  | .....do.....     | ♂    | 831     | 225   | 185       | 111         |
| 225 | .....do..... |  |  |  | .....do.....     | ♀    | 844     | 227   | 186       | * 108       |
| 226 | .....do..... |  |  |  | .....do.....     | ♂    | 510     | 132   | 180       | 108         |
| 227 | .....do..... |  |  |  | .....do.....     | ♂    | 750     | 204   | 182       | 113         |
| 414 | .....do..... |  |  |  | .....do.....     | ♀    | 1,115   | 310   | 183       | 110         |

| No. | Labials. |        |  |                           | Pre-oculars. | Post-oculars. | Temporals.                           | Scale rows. | Collection.        |
|-----|----------|--------|--|---------------------------|--------------|---------------|--------------------------------------|-------------|--------------------|
|     | Upper.   | Lower. | Enter eye.   | Touch first chin shields. |              |               |                                      |             |                    |
| 215 | 9        | 10     | 5, 6   | 5                         | 1            | 2             | $2 + 2$                              | 13          | Bureau of Science. |
| 218 | 9        | 10     | 4, 5, 6  | 5                         | 1            | 2             | $\left\{ \frac{1}{1+1} + 2 \right\}$ | 13          | Do.                |
| 219 | 9        | 9      | 5, 6   | 5                         | 1            | 2             | $2 + 2 + 2$                          | 13          | Do.                |
| 222 | 9        | 10     | 4, 5, 6  | 5                         | 1            | 2             | $\left\{ \frac{1}{1+1} + 2 \right\}$ | 13          | Do.                |
| 223 | 9        | 10     | $\left\{ \begin{smallmatrix} 5, 6 \\ 4, 5, 6 \end{smallmatrix} \right\}$ | 5                         | 1            | 2             | $2 + 2 + 2$                          | 13          | Do.                |
| 224 | 9        | 10     | 5, 6   | 5                         | 1            | 2             | $\left\{ \frac{1}{1+1} + 2 \right\}$ | 13          | Do.                |
| 225 | 9        | 10     | 5, 6   | 5                         | 1            | 2             | $\left\{ \frac{1}{1+1} + 2 \right\}$ | 13          | Do.                |
| 226 | 9        | 10     | 5, 6   | 5                         | 1            | 2             | $2 + 2 + 2$                          | 13          | Do.                |
| 227 | 9        | 9      | 5, 6   | 5                         | 1            | 2             | $2 + 2 + 2$                          | 13          | Do.                |
| 414 | 9        | 10     | $\left\{ \begin{smallmatrix} 5, 6 \\ 4, 5, 6 \end{smallmatrix} \right\}$ | 5                         | 1            | 2             | $2 + 2 + 2$                          | 13          | Do.                |

\* Extreme tip of tail missing.

Boulenger \* gives the range of ventrals as 171 to 188; of subcaudals, 100 to 112. Boulenger's largest specimen measures 1,520 millimeters in length.

\* Catalogue, loc. cit.

*Remarks.*—This species appears to be confined to Palawan and Balabac, and possibly also enters the Calamianes, north of Palawan. Outside Philippine territory it is known in southern India, Malay Peninsula, and East Indies. The species is arboreal. It is harmless.

**DENDRELAPHIS MODESTUS Boulenger**

PLATE 13, FIGS. 6 AND 7

*Dendrelaphis modestus* BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 91, pl. 4, fig. 4; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 261; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359.

? *Dendrelaphis fuliginosus* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 55; § D 6 (1911) 261; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 359.

*Description of species.*—(From No. 184, E. H. Taylor collection; collected at Isabela, Occidental Negros, at about 300 meters elevation, October 8, 1915, by E. H. Taylor.) (Adult male.) Head rather slenderer than in *Dendrelaphis terrificus*, distinct from body; rostral three-fourths as deep as wide, forming subequal sutures with internasals and nasals, rather pointed behind, broadly visible from above; internasals about as broad as long, sutures with nasal curved; prefrontals large, extending down on side to level of middle of eye, much wider than deep, longer than internasals; frontal one and two-fifths times as long as broad, equal to or a little less than its distance from end of snout, longer and wider than supraocular; parietals longer than frontal, longer than wide, with a row of 8 rather enlarged occipital scales bordering temporals and parietals posteriorly; nasal divided in subequal parts, both the same height; loreal elongate, two and a half times as long as high; preocular visible from above as a point, widely separated from frontal, widened above, coming to a point below; supraocular slightly projecting; 2 postoculars, the superior, largest, touching parietal, the inferior in contact with both anterior temporals; temporals 2 + 2 + 2, increasing greatly in size posteriorly; 9 upper labials, fifth and sixth entering eye; 10 lower labials, 5 touching anterior chin shields, which are wider and but little shorter than posterior pair; scales in 13 rows, the median row slightly enlarged and slightly differentiated from the lateral rows, but without pits; scales of other rows with pits; scales somewhat rectangular, overlapping on sides; ventrals and subcaudals with lateral keels and notches; ventrals 169; anal double; subcaudals 107; length of eye equal to or minutely less than

its distance from nostril; vertical diameter of eye less than the horizontal.

*Color in life.*—Rich olive brown above; head reddish to copper brown, which color continues some distance on neck; outer row of scales and half of second a slightly lighter shade of olive brown; below light bluish green with the edges of ventrals tinged with the olive brown of the outer row of scales; each scale has a bright bluish spot which is usually hidden until the skin is distended; skin between scales a purplish black; a few small, scattered, dark spots on head; the apical pits appear as minute dark spots; there is a trace of a dark line above last upper labials; the lower part of upper labials rather creamy yellow tinged with greenish; lower labials yellowish.

*Measurements of Dendrelaphis modestus Boulenger.*

|                | mm. |
|----------------|-----|
| Total length   | 914 |
| Snout to vent  | 660 |
| Tail           | 254 |
| Length of head | 24  |
| Width of head  | 10  |

*Variation.*—The species here described differs from Boulenger's *Dendrelaphis modestus* of Ternate in having a lower average of ventrals. I do not doubt that I have correctly referred the specimens to this species.

Griffin's *D. fuliginosus* \* is undoubtedly a young discolored specimen of this species. I have three specimens, a young and two adults, from Negros.

The greatest variation found in the Philippine specimens of this species occurs in one from Bubuan Island, Sulu Archipelago. An orange stripe is present in life behind the eye, continuing some distance on the neck. This stripe is formed by a wash color over the greenish ground color and disappears largely in alcohol. The eye is larger, its diameter greater than distance from eye to nostril. The labials on one side are broken, leaving two loreals, two preoculars, and two suboculars, the labials not entering the orbit.

*Remarks.*—This species in the Philippines is known to occur in Palawan, Mindoro, Negros, and Sulu. The type is from Ternate.

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\* See Taylor, Philip. Journ. Sci. § D 12 (1917) 359; in the statement "The type has a few more ventrals and subcaudals than the type of *D. modestus*" for a few more read a few less.

TABLE 34.—Measurements and scale counts of *Dendrelaphis modestus* Boulenger.

| No.  | Locality.               | Collector.                      | Sex or age. | Length. | Tail. | Ventrals. | Subcaudals. |
|------|-------------------------|---------------------------------|-------------|---------|-------|-----------|-------------|
|      |                         |                                 |             | mm.     | mm.   |           |             |
| 184  | Isabela, Negros .....   | E. H. Taylor .....              | ♂           | 914     | 254   | 169       | 107         |
| 210  | Ia Granja, Negros ..... | do .....                        | yg          | 325     | 85    | 176       | 108         |
| 826  | do .....                | do .....                        | ♂           | 1,055   | 299   | 173       | 110         |
| 409  | Mindoro .....           | Marine Biological Expedition .. | ♂           | 710     | a 26  | 178       | (a)         |
| 410  | do .....                | W. Schultze .....               | yg          | 325     | 85    | 179       | 112         |
| 411  | Palawan .....           | C. M. Weber .....               | ♂           | (b)     |       |           | 103         |
| 412  | do .....                | do .....                        | ♂           | 860     | 236   | 176       | 106         |
| 413  | Mindoro .....           | Marine Biological Expedition .. | ♂           | 1,051   | 296   | 179       | 112         |
| 1833 | Bubuan Island .....     | E. H. Taylor .....              | ♂           | 875     | b 190 | 176       | b 69        |

| No.  | Labials. |        |            |                           | Preoculars. | Postoculars. | Temporals. | Scale rows. | Collection.        |
|------|----------|--------|------------|---------------------------|-------------|--------------|------------|-------------|--------------------|
|      | Upper.   | Lower. | Enter eye. | Touch first chin shields. |             |              |            |             |                    |
| 184  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | E. H. Taylor.      |
| 210  | 9-10     | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 326  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 409  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Bureau of Science. |
| 410  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 411  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 412  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 413  | 9        | 10     | 5, 6       | 5                         | 1           | 2            | 2+2+2      | 13          | Do.                |
| 1833 | 9-8      | 10     | 5, 6       | 5                         | 1-2         | 2            | 2+2+2      | 13          | Do.                |

a Tip of tail mutilated.

b Body mutilated.

## DENDRELAPHIS TERRIFICUS (Peters)

## PLATES 22 AND 23

*Dendrophis picta*, var. B, GÜNTHER, Cat. Col. Snakes (1858) 149.*Dendrophis punctulata* (spec. o.) GÜNTHER, Cat. Col. Snakes (1858) 150.*Dendrophis terrificus* PETERS, Mon. Berl. Ak. (1872) 583; BOETTGER, Ber. Senck. Nat. Ges. (1886) 111; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 433.*Dendrophis philippinensis* GÜNTHER, Proc. Zool. Soc. London (1879) 78, pl. 4.*Dendrelaphis terrificus* BOULENGER, Fauna Brit. India, Rept. (1890) 339; Cat. Snakes Brit. Mus. 2 (1894) 90; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 261.? *Dendrelaphis caeruleatus* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 55; § D 6 (1911) 261.*Description of species.*—(From No. 83, E. H. Taylor collection, collected at Bunawan, Agusan, Mindanao, July 10, 1913,

by E. H. Taylor.) (Adult male.) Head very distinct from body; rostral at least one and one-third times as broad as deep, broadly visible from above, its longest suture with anterior nasal; internasals rather large, little longer than wide, the suture formed with nasals a curved line, which is longer than the suture formed with prefrontals; suture between prefrontals equal to or slightly longer than that between internasals; prefrontal as long as or a little longer than internasal, very much wider than long, extending down to near the level of middle of eye; frontal about one and a half times as long as broad, as long as but wider than supraoculars, not as long as its distance from end of snout; parietals but little longer than frontal, longer than wide; nasal divided; anterior part largest and highest; loreal narrow, long, two and a half to three times as long as wide; 1 preocular, visible from above, not touching frontal, in contact with 3 labials below; 2 postoculars, upper largest, in contact with parietal; temporals, 2 + 2 + 2; 9 upper labials, fifth and sixth entering eye (on the left side the 2 scales are nearly fused); 10 lower labials (9 on one side), 5 in contact with anterior chin shields, which are much shorter and wider than posterior; mental wider than deep; scales in 13 smooth rows, overlapping, disposed obliquely, more or less rectangular (with single apical pits), arranged in oblique, vertical rows; outer row of scales very much larger than median, which is scarcely larger than adjoining rows; ventrals keeled and notched on ends; ventrals 164; anal divided; subcaudals 96, in double rows; length of eye equal to its distance from nostril; eye longer than deep.

*Measurements of Dendrelaphis terrificus (Peters).*

|                     | mm.   |
|---------------------|-------|
| Total length        | 1,045 |
| Snout to vent       | 770   |
| Tail                | 275   |
| Length of head      | 30    |
| Width of head       | 17    |
| Eye to tip of snout | 10    |
| Length of eye       | 6     |

*Color in life.*—Bright greenish bronze (when scales are shed in alcohol, bluish green to blue), each scale with a concealed lower portion bright blue, only noticeable when the skin is distended; scales edged for the most part with black, the skin between them also black; head somewhat darker brown above; a broad black stripe begins behind eye and continues some distance on side of neck, growing narrower; a zigzag black line borders

ventrals; above this is a yellowish brown stripe, lighter than the body color, growing more indistinct as it continues along body; a zigzag line between subcaudals; a blackish area in loreal region; the black edges of the scales are more prominent on anterior part of body; lips and chin a greenish yellow; belly immaculate yellow.

TABLE 35.—Measurements and scale counts of *Dendrelaphis terrificus* (Peters).

| No. | Locality.                   | Collector.           | Sex. | Length. | Tail. | Ventrals. | Subcaudals. |
|-----|-----------------------------|----------------------|------|---------|-------|-----------|-------------|
|     |                             |                      |      | mm.     | mm.   |           |             |
| 82  | Mindanao -----              | E. H. Taylor -----   | ♀    | 1,060   | 285   | 163       | 95          |
| 88  | do -----                    | do -----             | ♂    | 1,045   | 275   | 164       | 96          |
| 81  | do -----                    | do -----             | ♂    | 765     | 200   | 162       | 94          |
| 405 | Camiguin <sup>a</sup> ----- | R. C. McGregor ----- | ♂    | 1,040   | 285   | 184       | 112         |
| 407 | do -----                    | do -----             | ♂    | 880     | 200   | 181       | 103         |
| 404 | Polillo -----               | C. Canonizado -----  | ♀    | 1,050   | 301   | 171       | 109         |
| 406 | do -----                    | do -----             | ♀    | 1,085   | 304   | 169       | 105         |
| 408 | Manila -----                | M. Ligaya -----      | ♀    | 1,255   | 330   | 177       | 97          |
| 213 | Siquijor -----              | A. Celestino -----   | ♂    | 840     | 225   | 173       | 104         |
| 214 | Bantayan -----              | do -----             | ♂    | 1,055   | 287   | 186       | 105         |

| No. | Labials. |        |            |                           | Pre-oculars. | Post-oculars. | Temporals. | Scale rows. | Collection.        |
|-----|----------|--------|------------|---------------------------|--------------|---------------|------------|-------------|--------------------|
|     | Upper.   | Lower. | Enter eye. | Touch first chin shields. |              |               |            |             |                    |
| 82  | 9        | 10-11  | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | E. H. Taylor.      |
| 83  | 9        | 10-9   | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 81  | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 405 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Bureau of Science. |
| 407 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 404 | 9        | 11     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 406 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 408 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 213 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |
| 214 | 9        | 10     | 5, 6       | 5                         | 1            | 2             | 2+2+2      | 13          | Do.                |

<sup>a</sup> Island north of Luzon.

*Variation*.—There are two fairly well-defined color variations evident in this species; one group represented in the Visayan Islands, Mindanao, and Polillo (*Dendrophis philippinensis* of Günther and *Dendrelaphis caeruleatus* of Griffin), and the second group in Luzon and islands to the north (*Dendrophis caudolineatus* of Peters \* non Gray and *Dendrophis octolineatus* † of Parenti and Picaglia).

\* Mon. Berl. Ak. (1861) 688.

† Atti. Soc. Nat. Modena, Mem. Orig. 5 (1886) 50.

The former group has a broad black band behind the eye which continues some distance on the neck and then disappears; the outer row of scales and the outer edges of the ventrals are black, thus forming a ragged-edged stripe; above this is a yellowish green stripe lighter than the lateral body color. The skin between scales is largely black, and many of the scales are edged with black.

The latter group has the black stripe behind the eye which continues to some distance on the neck where it disappears, usually to reappear as a narrow black line above the lateral yellow-green line on the posterior two-thirds of the body; the dark edges of the scales form 8 longitudinal lines, most of which are very distinct, and some of them continue on tail.

Due to the fact that the scale formulæ are practically the same in the two groups I do not believe they should be regarded worthy of subspecific distinction.

*Remarks.*—The species is known in the Philippines from Mindanao, Samar, Polillo, Negros, Bantayan, Banton, Siquijor, Ticao, Luzon, and Camiguin. It is an arboreal species. Outside the Philippines it is known in Celebes.

#### Genus PSEUDORHABDIUM Boulenger

*Rabdion*, part., DUMÉRIL and BIBRON, Mém. Ac. Sci. 23 (1853) 441, and Erp. Gén. 7 (1854) 115; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 426.

*Pseudorabdion* JAN, Arch. Zool. Anat. Phys. 2 (1862) 10.

*Oxycalamus* GÜNTHER, Rept. Brit. India (1864) 199; BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.

*Rhabdion* BOETTGER, Ber. Senck. Nat. Ges. (1886) 106.

*Pseudorhabdium* BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 328; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 261; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 362.

Maxillary teeth, 10 to 12, subequal; anterior mandibular teeth slightly longer than posterior; head not distinct from neck; eye small, with round pupil; nostril pierced in a minute nasal; internasals small; loreal present or absent; preocular small or absent; no anterior temporals, parietals in contact with labials; body cylindrical; scales smooth, without apical pits, in 15 rows; ventrals rounded; tail short; subcaudals in 2 rows.

*Key to the species of Pseudorhabdium Boulenger.*

a'. No loreal present.

b'. Frontal longer than broad; preocular usually present; supraocular small..... *P. longiceps* (Cantor) (p. 178).

- b<sup>1</sup>. Frontal little broader than long; supraoculars smaller still; preocular usually wanting..... *P. oxycephalum* (Günther) (p. 179).  
 a<sup>2</sup>. Loreal present; no preocular; postocular distinct or fused with supraocular..... *P. mcnamaræ* Taylor (p. 180).

The three known species of the genus are found in the Philippines. All are small, burrowing snakes, seldom attaining a length of more than 280 millimeters. *Pseudorhabdium oxycephalum* and *P. mcnamaræ* appear to be confined to the Philippines. The third species is widely distributed, being found in Malay Peninsula and other large East Indian islands.

#### PSEUDORHABDIUM LONGICEPS (Cantor)

- Calamaria longiceps* CANTOR, Cat. Mal. Rept. (1847) 63, pl., fig. 1.  
*Rabdion torquatum* DUMÉRIl and BIBRON, Erp. Gen. 7 (1854) 119; PETERS, Mon. Berl. Ak. (1861) 684; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 426.  
*Pseudorabdion torquatum* JAN, Arch. Zool. Anat. Phys. 2 (1862) 10, and Icon. Gén. (1865) 10, pl. 3, fig. 3.  
*Oxycalamus longiceps* GÜNTHER, Rept. Brit. Ind. (1864) 199; STOLICZKA, Journ. As. Soc. Bengal 42 (1873) 120.  
*Pseudorhabdion longiceps* BOULENGER, Ann. & Mag. Nat. Hist. V 16 (1885) 389.  
*Rhabdion torquatum* BOETTGER, Ber. Senck. Nat. Ges. (1886) 106.  
*Pseudorhabdium longiceps* BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 329; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 261; BARBOUR, Mem. Mus. Comp. Zool. Harv. Coll. 44 (1912) 119.

*Description of species.*—(From Boulenger, Catalogue.)  
 “Snout rather pointed. Rostral small, as deep as broad, well visible from above; suture between the internasals one third or one fourth the length of that between the præfrontals; frontal a little longer than broad, as long as or a little shorter than its distance from the end of the snout, shorter than the parietals, more than twice as broad as the supraocular; præocular small (rarely absent); one postocular; five upper labials, third and fourth entering the eye; symphysial in contact with the anterior chin-shields; three lower labials in contact with the anterior chin-shields, which are about twice as large as the posterior. Scales in 15 rows. Ventrals 129–146; anal entire; subcaudals 10–28. Tail pointed. Iridescent brown or black, with or without a yellowish collar; usually a yellowish vertical spot above the angle of the mouth.”

#### *Measurements of Pseudorhabdium longiceps (Cantor).*

|               | mm. |
|---------------|-----|
| Total length  | 230 |
| Snout to vent | 195 |
| Tail          | 35  |

**Remarks.**—The only record for this snake in the Philippines is that of Peters, at Daraga, Luzon. Evidently it is very rare. The species is known from Malay Peninsula, Borneo, Nias, Sumatra, and Celebes.

**PSEUDORHABDIUM OXYCEPHALUM (Günther)**

*Rhabdosoma oxycephalum* GÜNTHER, Cat. Col. Snakes (1858) 242.

*Oxycalamus oxycephalus* GÜNTHER, Proc. Zool. Soc. London (1873) 168 (fig.); BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.

*Pseudorhabdium oxycephalum* BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 329; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 364.

**Description of species.**—Closely allied to *Pseudorhabdium longiceps*. Frontal a little broader than long, about half as long

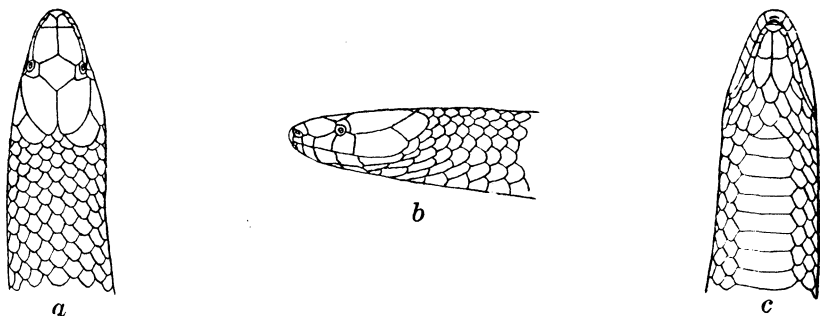


FIG. 14. *Pseudorhabdium oxycephalum* (Günther); after Boulenger; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

as parietal; supraoculars narrow, smaller still, and confluent with postocular; no separate postocular; rostral barely visible above; internasals small, about one-sixth of prefrontals; latter longer than wide, in contact with 2 labials, entering eye; internasal in contact with second labial; no loreal or preocular; a large posterior temporal bordering parietals; frontal broader than long, about four or five times as wide as supraocular; 5 upper labials, third and fourth entering eye, fifth largest; 3 lower labials touching first chin shields, which are as long as but narrower than second pair; scales in 15 smooth rows, with no apical pits; anal entire; male, ventrals, 136; subcaudals, 23; female, ventrals, 152; subcaudals, 16.

**Color.**—Uniform iridescent blackish brown.

*Measurements of Pseudorhabdium oxycephalum (Günther).*

|               | mm. |
|---------------|-----|
| Total length  | 280 |
| Snout to vent | 260 |
| Tail          | 20  |

*Remarks.*—This species is known from Negros, where it was collected by A. B. Meyer. The type, collected by Cuming, is labeled "Philippines;" the exact locality is no longer known. Only a few specimens appear to be known.

**PSEUDORHABDIUM MCNAMARÆ Taylor**

*Pseudorhabdium mcnamaræ* TAYLOR, Philip. Journ. Sci. § D 12 (1917) 263.

*Description of species.*—(From the type, No. 196, E. H. Taylor collection; collected on Canlaon Volcano, Occidental Negros, December 24, 1915, at an elevation of about 900 meters, by E. H. Taylor.) Rostral small, about as wide as high, a large part visible from above; internasals moderate, five-sided, their

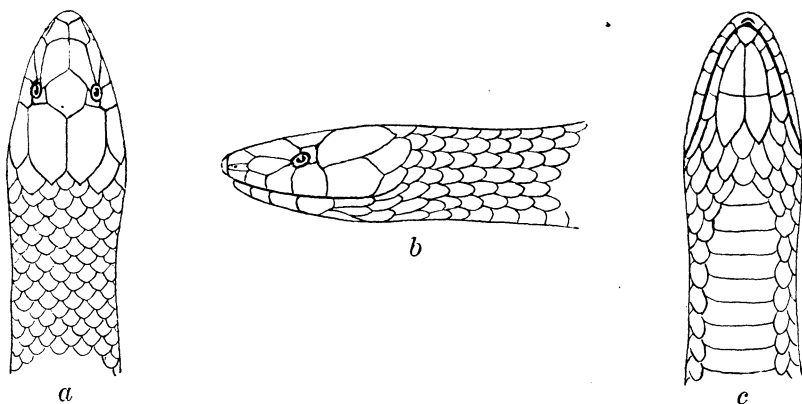


FIG. 15. *Pseudorhabdium monamaræ* Taylor; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

sutures with nasal and prefrontal equal, forming their shortest suture with loreal; prefrontals nearly three times as large as internasals, entering eye, touching frontal, loreal, internasal, and supraocular, the longest suture with loreal, the shortest with supraocular; frontal hexagonal, a little wider than long, the sides touching supraoculars shortest, the parietal sides longest; parietals at least twice as long as wide, six-sided, in contact with fifth labial; nasal rectangular, much elongate, with nostril pierced near anterior edge close by rostral; behind this a very much enlarged, elongate loreal, in contact with second and third labials, entering eye; supraocular extending over only posterior part of eye and somewhat behind; postocular fused with supraocular; no anterior temporals; a single large posterior temporal behind fifth labial, bordering on parietal; 5 upper labials, fifth largest, in the following order of size: fifth, third, fourth, second, first; third and fourth enter eye; 5 lower

labials; mental small, in contact with anterior chin shields, and separating first labials; 3 labials touch anterior chin shields; second pair of chin shields slightly smaller than first; eye very small; anal undivided; ventrals, 140; subcaudals, 22; scales smooth, in 15 rows.

*Color in life.*—Above very shiny, more or less iridescent, dark blackish brown to bluish brown; about neck is a more or less distinct yellow collar (dim or almost wanting in adults), formed above by three or four small yellow spots; a cream-colored spot on fifth upper labial; below canary to yellowish cream with a dark area on outer edge of each ventral; posterior ventrals mottled, and subcaudals almost uniformly dark; occasional dark areas on middle part of ventrals.

*Measurements of the type of Pseudorhabdium mcnamarae Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 242 |
| Snout to anus | 220 |
| Tail          | 22  |
| Width of head | 5.5 |
| Width of body | 5   |

*Variation.*—Males and females differ in the number of ventrals and subcaudals, the averages being for males: ventrals, 131; subcaudals, 28; for females, ventrals, 142; subcaudals, 22. Four specimens show the postocular fused with the supraocular, and in No. 197 a preocular is present. There is some variation in the relative length and width of the frontal. In some specimens these are equal and in one or two the length slightly exceeds the width. The females have the underside of the tail uniformly dark, while the males have it mottled and lighter. Nos. 192, 193, 194, and 195 have the second and third lower labials fused, thus leaving only two labials touching the first chin shields.

*Remarks.*—The species is rather common at altitudes of 800 to 900 meters on Canlaon Volcano. No specimens were taken at a higher or lower altitude. They were found under logs and rotting trash. They feed on earthworms and are in turn preyed upon by *Cyclocorus lineatus*, which is plentiful in the same locality. Specimens were usually found in pairs, a male and a female, in the same place. The females taken in December contained three undeveloped eggs. The species is named for Mr. Homer McNamara, superintendent of the La Carlota Agricultural Station, who rendered able assistance in making collections on the volcano.

This species represents a distinct section of the genus in having a loreal present.

TABLE 36.—Measurements and scale counts of *Pseudorhabdium mcnamarae* Taylor.

| No. | Locality.                   | Collector.        | Sex or age. | Length.    |
|-----|-----------------------------|-------------------|-------------|------------|
|     |                             |                   |             | <i>mm.</i> |
| 186 | Mount Canlaon, Negros ..... | E. H. Taylor..... | ♀           | 193        |
| 187 | .....do .....               | .....do .....     | ♂           | 130        |
| 188 | .....do .....               | .....do .....     | ♂           | 163        |
| 189 | .....do .....               | .....do .....     | ♀           | 217        |
| 190 | .....do .....               | .....do .....     | ♀           | 229        |
| 191 | .....do .....               | .....do .....     | ♀           | 208        |
| 192 | .....do .....               | .....do .....     | ♀           | 212        |
| 193 | .....do .....               | .....do .....     | ♂           | 163        |
| 194 | .....do .....               | .....do .....     | ♂           | 173        |
| 195 | .....do .....               | .....do .....     | yg          | 86         |
| 196 | .....do .....               | .....do .....     | ♀           | 242        |
| 197 | .....do .....               | .....do .....     | ♀           | 209        |

| No. | Tail.      | Ventrals. | Subcaudals. | Preoculars. | Character of postocular. | Collection.   |
|-----|------------|-----------|-------------|-------------|--------------------------|---------------|
|     | <i>mm.</i> |           |             |             |                          |               |
| 186 | 17         | 143       | 23          | 0           | Distinct.....            | E. H. Taylor. |
| 187 | 16         | 134       | 27          | 0           | .....do .....            | Do.           |
| 188 | 18         | 135       | 28          | 0           | .....do .....            | Do.           |
| 189 | 18         | 145       | 22          | 0           | .....do .....            | Do.           |
| 190 | 20         | 142       | 21          | 0           | Fused .....              | Do.           |
| 191 | 19         | 141       | 22          | 0           | Distinct.....            | Do.           |
| 192 | 18         | 145       | 20          | 0           | .....do .....            | Do.           |
| 193 | 20         | 129       | 27          | 0           | .....do .....            | Do.           |
| 194 | 20         | 130       | 28          | 0           | Fused .....              | Do.           |
| 195 | 11         | 130       | 29          | 0           | Distinct.....            | Do.           |
| 196 | 22         | 140       | 22          | 0           | Fused .....              | Do.           |
| 197 | 20         | 140       | 23          | 1           | .....do .....            | Do.           |

### Genus TYPHLOGEOPHIS Günther

*Typhlogeophis* GÜNTHER, Proc. Zool. Soc. London (1879) 77; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 351.

*Typhlogeophis* CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.

"Maxillary teeth 8, subequal; mandibular teeth subequal. Head not distinct from neck; eye concealed under the ocular shield; no supraocular; nostril pierced in a minute nasal; internasals small; no loreal or præocular; no temporals, the parietals in contact with the labials. Body cylindrical; scales smooth, without apical pits, in 15 rows. Tail short; subcaudals in two rows." (*Boulenger.*)

This genus is known only from the Philippines. It consists of a single known species, *Typhlogeophis brevis*, which is known only from the type. Judging by the absence of external eyes, the species is subterrestrial in habit.

**TYPHLOGEOPHIS BREVIS** Günther

PLATE 24, FIGS. 1 TO 4

*Typhlogeophis brevis* GÜNTHER, Proc. Zool. Soc. London (1879) 77; BOETTGER, Ber. Senck. Nat. Ges. (1886) 106; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 351; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Typhlogeophis brevis*, CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 425.

*Description of species.*—(From Boulenger.) "Snout rather pointed; rostral very small, nearly as deep as broad, just visible from above; suture between the internasals about half the length of that between the præfrontals; frontal small, as long as broad, shorter than its distance from the end of the snout, half as long as the parietals; five upper labials, fourth in contact with the ocular, fifth very large; two pairs of chin-shields, anterior largest. Scales in 15 rows. Ventrals 153; anal entire; subcaudals about 15. Uniform blackish, scales and shields with whitish edge.

"Total length, 330 millim."

*Remarks.*—Only the type specimen appears to have been collected, and the exact locality is now unknown. It was taken by A. Everett, either on Mindanao or on Dinagat.

**Genus CALAMARIA** Boie

*Calamaria* BOIE, Ferussac, Bull. Sc. Nat. 9 (1826) 236; Isis (1827) 519; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 60; GÜNTHER, Cat. Col. Snakes (1858) 3; Rept. Brit. India (1864) 105; JAN, Arch. Zool. Anat. Phys. 2 (1862) 4; BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; BOULENGER, Fauna Brit. India, Rept. (1890) 281; Cat. Snakes Brit. Mus. 2 (1894) 330; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 424.

*Calamaria*, part., SCHLEGEL, Phys. Serp. 2 (1837) 25; WAGLER, Syst. Amph. (1830) 191.

*Typhlocalamus* GÜNTHER, Proc. Zool. Soc. (1872) 595.

"Maxillary teeth 8 to 11, subequal; anterior mandibular teeth a little longer than the posterior. Head not distinct from neck; eye small, with round pupil; nostril pierced in a minute nasal;

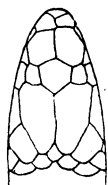


FIG. 16. *Typhlogeophis brevis* Günther; after Boulenger: head, dorsal view.

no loreal;\* no internasals; præocular present or absent; no temporals, the parietals in contact with the labials. Body cylindrical; scales smooth, without apical pits, in 13 rows; ventrals rounded. Tail short; subcaudals in two rows." (*Boulenger.*)

This genus is widely distributed and consists of numerous species, most of which are local and variable. The snakes are small, never or very rarely attaining half a meter in length, most of the species being less than a third of a meter in length. The species are without grooved fangs, and are harmless.

*Key to the Philippine species of Calamaria Boie.†*

- a<sup>1</sup>. Mental in contact with anterior chin shields; no loreal.
  - b<sup>1</sup>. Frontal less than twice as broad as supraocular; young, reddish white with black rings; adults, black above, barred with alternate bands of black and white below..... *C. grayi* Günther (p. 184).
  - b<sup>2</sup>. Frontal almost twice as broad as supraocular; rostral as deep as broad; frontal nearly as long as parietals; young, light brown above, barred with darker brown; only a few anterior bars in adults; uniform yellowish below..... *C. bitorques* Peters (p. 185).
  - b<sup>3</sup>. Rostral as deep as broad; frontal shorter than parietals.
    - c<sup>1</sup>. Tail length in total length fourteen to twenty times, brown above, with several fine light streaks on each side; yellow or barred black and yellow below.
      - C. gervaisii* Duméril and Bibron (p. 186).
    - c<sup>2</sup>. Tail length in total length nine and one-half times; brown with a row of white dots on sides, on outer scale row.
      - C. suluensis* sp. nov (p. 189).
  - b<sup>4</sup>. Rostral broader than deep; frontal shorter than parietals; brown above with longitudinal series of black dots; a yellow spot on each side of neck..... *C. mindorensis* Boulenger (p. 190).
- a<sup>2</sup>. Mental not in contact with anterior chin shields; no loreal.
  - b<sup>1</sup>. Diameter of eye much more than its distance from mouth; brown above, with 2 longitudinal rows of dark spots on each side of a line of white dots..... *C. everetti* Boulenger (p. 191).
  - b<sup>2</sup>. Diameter of eye less than half its distance from mouth; 250 ventrals; dark brown above, with the 2 outer scale rows tipped with yellowish; a yellow collar on neck; a pair of large pale lateral spots at base of tail..... *C. mearnsi* Stejneger (p. 193).
- a<sup>3</sup>. Mental in contact with first chin shields; a loreal present; above, brown with darker dots; a dark brown nuchal collar, edged with yellow anteriorly and posteriorly; immaculate below.
  - C. tropica* sp. nov. (p. 194).

**CALAMARIA GRAYI Günther**

*Calamaria grayi* GÜNTHER, Cat. Col. Snakes (1858) 6; BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; BOULENGER, Cat. Snakes Brit.

\* *Calamaria tropica* has a loreal.—E. H. T.

† Casto de Elera lists *C. vermiformis* and *C. temminckii*. These records are probably erroneous.

Mus. 2 (1894) 338; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 424; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Calamaria lumbricoidea*, part., GÜNTHER, Cat. Col. Snakes (1858) 5.

*Calamaria philippinica* STEINDACHNER, Verh. Zool. Bot. Ges. Wien 17 (1867) 514, pl. 13, figs. 4-6.

*Description of species.*—(From Boulenger.) "Snout very short and broadly rounded. Rostral nearly as deep as broad, well visible from above; frontal a little longer than broad, shorter than the parietals, not twice as broad as the supraocular; one præ- and one postocular; diameter of the eye less than its distance from the mouth; five upper labials, the four anterior subequal in size, third and fourth entering the eye; symphysial in contact with the anterior chin-shields; two pairs of chin-shields, in contact with each other. Scales in 13 rows. Ventrals 175-195; anal entire; subcaudals 14-24. Tail ending in a rather obtuse point. Young reddish white, with black rings; adult uniform blackish above, alternately barred black and white below.

*Measurements of Calamaria grayi Günther.*

|               | mm. |
|---------------|-----|
| Total length  | 365 |
| Snout to vent | 330 |
| Tail          | 35  |

*Remarks.*—The types were collected in the Philippines by H. Cuming, 1832-1834; the exact locality is not known, and the species has not been rediscovered.

**CALAMARIA BITORQUES Peters**

*Calamaria gervaisii*, part., GÜNTHER, Cat. Col. Snakes (1858) 4.

*Calamaria bitorques* PETERS, Mon. Berl. Ak. (1872) 585; BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; BOULENGER, Cat. Snakes Brit.

Mus. 2 (1894) 338; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 424; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Description of species.*—(From No. 606, Bureau of Science collection; locality and collector unknown, probably from Luzon.) (Adult female.) Head not distinct from body; rostral as wide as deep, broadly visible above; internasals and loreal wanting; prefrontals very large, in contact with 2 labials and rostral, not entering eye; frontal distinctly longer than broad, little less than twice as broad as supraoculars, longer than its distance to end of snout, little shorter than parietals; latter large, as broad as long; nostril in a minute nasal; 1 small preocular; 1 small postocular touching 2 labials and parietal; no anterior temporals; a large posterior temporal bordering parietal; 5 upper labials, last very large, first 4 subequal, third and fourth entering eye; mental rather large, in contact with

large anterior pair of chin shields; second pair about half as large, not separated; 5 lower labials, 3 touching first pair of chin shields; scales in 13 rows, smooth; ventrals 186; anal entire; subcaudals 18; diameter of eye equal to or slightly less than its distance from mouth; tail ending in a blunt point.

*Color in alcohol.*\*—Dull yellowish brown above with brownish bands separated by lighter interspaces on anterior fourth of body; these bands are narrow, scarcely more than the width of one scale; the yellowish interspaces are only two or three scales wide; head with a brown spot on each parietal; below, uniform yellowish.

*Measurements of Calamaria bitorques Peters.*

|                | mm. |
|----------------|-----|
| Total length   | 365 |
| Snout to vent  | 343 |
| Tail           | 22  |
| Width of head  | 7.5 |
| Length of head | 9.8 |

*Variation.*—The females have a much larger number of ventrals and a smaller number of subcaudals than the males. The range known is: For females, ventrals, 183 to 199; subcaudals, 13 to 18; for males, ventrals, 151 to 158; subcaudals, 18 to 21.

*Remarks.*—This rare species is known only from Luzon. There is a single specimen in the collection of the Bureau of Science, without locality attached. Boulenger † lists five specimens from Luzon.

**CALAMARIA GERVAISII Duméril and Bibron**

*Calamaria virgulata* (non Boie) EYDOUX and GERVAIS, in Guér. Mag. Zool. Cl. 3 (1837) pl. 16, figs. 7–10; Voy. Favorite, Zool 5<sup>2</sup> (1839) pl. 30, figs. 7–10.

*Calamaria gervaisii* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 76; JAN, Arch. Zool. Anat. Phys. 2 (1862) 8; Icon. Gén. (1865) 10, pl. 2, fig. 1; GÜNTHER, Proc. Zool. Soc. London (1879) 77; PETERS, Mon. Berl. Ak. (1861) 684; MULLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 12; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 80; BOETTGER, Ber. Senck. Nat. Ges. (1886) 105; BOULENGER, Cat. Snakes Brit. Mus. 2 (1894) 338; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Calamaria gervaisii*, part., GÜNTHER, Cat. Col. Snakes (1858) 4.

\* The specimen is in an indifferent state of preservation and most of the original color and markings have disappeared.

† Catalogue, loc. cit.

There are two known subspecies of *Calamaria gervaisii* in the Philippines.\* These are *Calamaria gervaisii gervaisii* and *Calamaria gervaisii iridescens*. They may be distinguished as follows:

*Key to the subspecies of Calamaria gervaisii Duméril and Bibron.*

a<sup>1</sup>. Ventrals, males, 148 to 158; females, 162 to 167; subcaudals, males, 15 to 18; females, 12 or 13; brown with 3 lateral rows of white dots, and usually 4 dorsal rows of black dots.

C. g. *gervaisii* Duméril and Bibron (p. 187).

a<sup>2</sup>. Ventrals, males, 158 to 165; females, 178 to 180; subcaudals, males, 18 or 19; females, 14; dark iridescent brown above; only a single row of white dots along side of body.

C. g. *iridescens* Taylor (p. 188).

The former subspecies is especially common in Luzon, even in the city of Manila.† It is a gregarious, burrowing species.

**CALAMARIA GERVAISII GERVAISII** Duméril and Bibron ‡

*Description of subspecies.*—(From No. 941, E. H. Taylor collection, collected in Manila by W. Schultze.) (Adult female.) Head not distinct from body; rostral broadly visible above; prefrontals large; no internasals; frontal longer than broad, about twice the width of supraocular, much shorter than parietals; latter in contact for more than half their length; nasal very small, a mere rim around nostril, surrounded by rostral, first labial, and prefrontal; 1 small preocular; 1 small postocular; 6 upper labials, fifth largest, third and fourth entering eye; no anterior temporals; one posterior temporal; 6 lower labials, the 3 anterior touching first chin shields which are in contact with mental; second pair of chin shields about half as large as first pair, barely in contact anteriorly. Scales in 13 smooth rows; ventrals, 162; anal single; subcaudals, 12. Tail length is contained in total length twenty times.

*Color in life.*—Above, light brown with four rows of small, longitudinal, dark dots dorsally. The three outer scale rows with white dots, those on first and third rows largest and most distinct; upper and lower edges of scales of outer row very dark brown, as are also edges of ventral scales; belly yellow-orange; ventrals with numerous small dots of dark color, with posterior edges of many scales dimly edged with darker; lower

\* Boulenger's variety *C. may* represent a distinct subspecies.

† Kenneth, Carl, and Bettie Knust, three ardent young herpetologists, collected more than 300 specimens of *C. gervaisii gervaisii* about the yard of their home in Malate, Manila.

‡ For synonymy see species.

part of upper labials yellow; chin and lower labials yellow, latter with dark dots; a dark line on underside of tail.

*Measurements of Calamaria gervaisii gervaisii Duméril and Bibron.*

|                | mm. |
|----------------|-----|
| Total length   | 260 |
| Snout to vent  | 247 |
| Tail           | 13  |
| Length of head | 7.5 |
| Width of head  | 5.5 |

*Variation.*—The chief differences in specimens are sexual. The females have longer bodies and shorter tails than the males, and a correspondingly larger number of ventrals and smaller number of subcaudals. The length of the tail in the females is contained in the total body length twenty times; in the males, fourteen times.

*Remarks.*—The females lay from three to six eggs, which are usually three times as long as wide. The young agree very well with the adults in coloration. A very common species. Due to its gregarious habits it is known to many Filipino peoples as *ahas-na-cuyog*. The subspecies is restricted to the Philippines; known to occur in Luzon.

#### CALAMARIA GERVAISII IRIDESCENS Taylor

*Calamaria gervaisii iridescens* TAYLOR, Philip. Journ. Sci. § D 12 (1917) 360.

*Description of subspecies.*—(No. 201, E. H. Taylor collection; collected on Canlaon Volcano, Occidental Negros, December 23, 1915, at an elevation of about 900 meters, by E. H. Taylor.) (Adult female.) Rostral a little deeper than broad, the part visible above equal to the suture between prefrontals; internasals absent; prefrontal very large, about as broad as long, touching 2 labials laterally; loreal absent; frontal much longer than its distance from end of snout, twice as wide as supraoculars, shorter than and not as wide as parietals; nostril pierced in a minute nasal, latter fan-shaped; 1 preocular, very small; supraocular scarcely twice as long as wide; 1 small postocular; 5 upper labials, last largest, third and fourth entering eye; an elongate posterior temporal behind fifth labial, bordering parietal; mental as deep as wide, touching chin shields; 3 labials touch first pair of chin shields, which are much larger and slightly wider than second pair; scales in 15 rows; ventrals 178, subcaudals 14; anal single; tail length 21.8 in total length.

*Color in life.*—Dark, iridescent brown above, with a very indistinct series of four darker lines, each minutely powdered with a lighter color. Series of white dots begin on outer row of scales and continue regularly to base of tail. A second row of dots begins on second row of scales, but continues only a short distance. Top of head mottled with dark brown, labials almost covered with yellowish white. Lower labials and scales on neck and chin yellow, with brown maculations. Ventrals barred across belly with blackish brown and canary-yellow bars; less heavy coloration in front of anus; underside of tail with a median dark line.

*Measurements of Calamaria gervaisii iridescens Taylor.*

|               | mm. |
|---------------|-----|
| Total length  | 306 |
| Snout to vent | 292 |
| Tail          | 14  |

*Variation.*—Five specimens taken agree very well, save that the barring on the belly is much less distinct in very young ones. The females have more ventrals and less subcaudals than the males.

*Remarks.*—This subspecies is common on Canlaon Volcano. Specimens were obtained from under logs. One specimen was disgorged by a captured specimen of *Cyclocorus lineatus*.

**CALAMARIA SULUENSIS sp. nov.**

*Calamaria gervaisii* TAYLOR, Philip. Journ. Sci. § D 13 (1918) 260.

*Type.*—No. 1837, Bureau of Science collection; collected on Cagayan Sulu, November, 1917, by E. H. Taylor.

*Description of type.*—Rostral about as broad as deep, visible above; no internasal; prefrontals large, in contact with 2 labials laterally; frontal about one-third longer than wide, two and a half times as wide as supraocular, shorter than parietals; latter in contact for a little more than half their length, in contact with fifth labial; nasal a mere rim about nostril; no loreal present; 1 preocular, higher than wide; 1 postocular; no anterior temporals; 1 posterior temporal; 6 upper labials in following order of size: fifth, second, third, first, fourth, sixth, the third and fourth entering eye; 6 lower labials, 3 touching anterior chin shields, first pair of labials not in contact; posterior chin shields nearly three-fourths as long as anterior. Scales in 13 smooth rows; ventrals 154; anal single; subcaudals 25; tail much narrowed behind anus, its length contained in total body length nine and a half times.

*Color in life.*—Above iridescent brown; many scales on anterior part of body with darker spots; a row of white spots on outer row of scales; lower edge of outer scale row brown, and the same color on extreme outer edge of ventrals; a second row of white dots begins on second row of scales, but only continues a very short distance; head brown with very dim dark spots; upper labials yellowish on their lower parts; lower labials with brown spots; mental and anterior parts of first chin shields dark; belly immaculate canary; underside of tail yellow with a median dark brown line.

*Measurements of Calamaria suluensis sp. nov.*

|                | mm. |
|----------------|-----|
| Total length   | 266 |
| Snout to vent  | 239 |
| Tail           | 27  |
| Length of head | 8   |
| Width of head  | 5   |

*Remarks.*—This species is related to *Calamaria gervaisii* Dumeril and Bibron, but differs from it in coloration and marking, and in having a longer tail with a higher number of subcaudals. The average number of subcaudals for *C. gervaisii* is about 17 for males and 13 for females. In the type of *C. suluensis*, an adult female, there are 25 subcaudals, nearly double the number for females of *C. gervaisii*. The length of the tail of the females of *C. gervaisii* is contained in the total length twenty times; of the males, fourteen times. In *C. suluensis* the length of the tail is contained in the total length nine and a half times; also, the head is slightly longer, and the second pair of chin shields is longer than in *C. gervaisii*.

The type was collected under a log near one of the lakes on the small isolated island Cagayan Sulu, in the southern part of Sulu Sea.

**CALAMARIA MINDORENSIS Boulenger**

*Calamaria mindorensis* BOULENGER, Ann. & Mag. Nat. Hist. VI 16 (1895) 481; Cat. Snakes Brit. Mus. 3 (1896) 646 (addenda); GRIF-FIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Description of species.*—(From Boulenger, Catalogue.) “Rostral a little broader than deep, visible from above; frontal longer than broad, twice as broad as the supraocular, shorter than the parietals; a præ- and a postocular; diameter of the eye equal to its distance from the mouth; five upper labials, third and fourth entering the eye; symphyisial in contact with the anterior chin-shields; two pairs of chin-shields in contact with each

other. Scales in 13 rows. Ventrals 193; anal entire; subcaudals 15. Brown above, with longitudinal series of black dots; a yellow spot on each side of the neck; a white spot on each scale of the outer row; upper lip and lower parts yellowish; a black spot at the outer end of each ventral; a black line along the middle of the tail."

*Measurements of Calamaria mindorensis Boulenger.*

|               | mm. |
|---------------|-----|
| Total length  | 240 |
| Snout to vent | 227 |
| Tail          | 13  |

*Remarks.*—The type of this species, an adult female, was collected in Mindoro by A. Everett. Only the type appears to have been discovered.

The new species of *Calamaria* herein described, *Calamaria tropica*, is from Mindoro but differs from *C. mindorensis* in the presence of a loreal, and a dark brown neck band followed by a yellow band; a difference of 45 ventrals is also evident.

**CALAMARIA EVERETTI Boulenger**

PLATE 24, FIGS. 5 TO 9

*Calamaria everetti* BOULENGER, Proc. Zool. Soc. London (1893) 525; Ann. & Mag. Nat. Hist. VI 14 (1894) 84; Cat. Snakes Brit. Mus. 2 (1894) 340, pl. 18, figs. 1, 2; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 599; § D 6 (1911) 262.

*Description of species.*—(From No. 565, Bureau of Science collection; collected at Iwahig, Palawan, March, 1909, by C. M. Weber.) (Adult male.) Rostral distinctly broader than high, rather narrowly visible from above; internasals wanting; prefrontals large, bordering labials laterally; frontal one and a half times as long as broad, slightly shorter than parietals, less than twice as broad as supraocular; latter much shorter than frontal; parietals elongate, broader than long; nostril pierced in nasal, small; no loreal present; an elongate preocular, broader inferiorly; 1 small, distinct preocular; no anterior temporals; a large posterior temporal bordering parietal; 5 upper labials, third and fourth entering eye, fifth very large; 5 lower labials, first pair meeting behind mental, 3 touching anterior chin shields; latter followed by a second, smaller, pair of chin shields, in contact with each other; scales in 13 rows, smooth; ventrals, 177; anal single;



FIG. 17. *Calamaria everetti* Boulenger; after Boulenger; head, lateral view.

subcaudals, 24 pairs; head rather elongate; eye rather large, its diameter much more than its distance from mouth.

*Color in alcohol.*—Above blackish brown with irregular rows of black dots; a continuous line of white dots covering outer row of scales; edges of ventral scales black, forming a zigzag black line below the white dotted line; another black line immediately above the lateral white line on second scale row; a white line from snout along upper labials, covering them save for their upper parts; top of head lighter brown with some darker mottling, particularly on outer edge of parietals; two whitish collars, one immediately behind parietals, and the other five scales back, neither crossing entirely the dorsal surface of neck; a distinct dark spot on fifth labial and a posterior temporal spot; below, chin, neck, belly, and underside of tail immaculate yellowish.

*Measurements of Calamaria everetti Boulenger.*

|                |     |
|----------------|-----|
|                | mm. |
| Total length   | 315 |
| Snout to vent  | 289 |
| Length of head | 8   |
| Width of head  | 5.5 |

*Variation.*—A second specimen from the same locality agrees well in scalation. The lateral white line is very irregular, as many scales in the second row are white. Boulenger\* lists three varieties of this species (only two of which are Philippine), as follows:

- A. Nape dark brown, with a yellow collar; belly unspotted.
- B. No collar; belly unspotted.
- C. No collar; a series of black dots along the middle of belly.

TABLE 37.—*Measurements and scale counts of Calamaria everetti Boulenger.*

| No. | Locality.        | Collector.       | Sex. | Length. | Tail.  | Ventrals. | Subcaudals. | Collection.        |
|-----|------------------|------------------|------|---------|--------|-----------|-------------|--------------------|
| 565 | Iwahig, Palawan. | C. M. Weber..... | ♂    | mm. 315 | mm. 26 | 177       | 24          | Bureau of Science. |
| 952 | .....do.....     | C. H. Lamb.....  | ♂    | 295     | 24     | 181       | 23          | Do.                |

The first variety (A), a young specimen from Sarawak, Borneo, is the type. The second and third varieties (B and C) are from Palawan. The known ventral range is 144 to 184;

\* Loc. cit.

the subcaudal, 16 to 23; the low ventral count, 144, is from the Sarawak specimen. In the Palawan specimens the average count is 179 for ventrals. The variations in color may be due to the age of the specimens.

*Remarks.*—Griffin \* has called attention to the fact that the Bureau of Science specimens differ in color and markings from those listed by Boulenger. Larger series of specimens may show constant variations which merit specific designation for these varieties.

#### CALAMARIA MEARNSI Stejneger

*Calamaria mearnsi* STEJNEGER, Smith. Misc. Coll. 50 (1908) 30;  
GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 262.

*Description of species.*—(After the type description.) Rostral well visible from above; frontal slightly longer than broad, more than twice as broad as supraoculars, shorter than parietals; 1 preocular; 1 postocular; diameter of eye less than half its distance from edge of mouth; 5 supralabials, third and fourth entering eye; 2 pairs of chin shields, in contact with each other; mental separated from chin shields by first pair of lower labials; scales in 13 rows; ventrals 251; anal entire; subcaudals 12 pairs; tip of tail rounded.

*Color in alcohol.*—Dark brown above, each of the two outer scale rows broadly tipped with pale yellowish; parietals and prefrontals with pale yellowish markings; a pale yellowish collar, about two scales wide; seven scale rows behind head; a pair of large pale spots on sides at base of tail; tip of tail pale, except extreme point which is dark; underside uniform pale with ends of ventrals like back; a dark brown line along middle of underside of tail.

#### *Measurements of Calamaria mearnsi Stejneger.*

|               | mm. |
|---------------|-----|
| Total length  | 270 |
| Snout to vent | 262 |
| Tail          | 8   |

*Remarks.*—This species is known only from the type. It was collected in Tangob, northern Mindanao, June 10, 1906, by Maj. E. A. Mearns.

Stejneger remarks: "This species is apparently most closely allied to *Calamaria everetti* and the *C. pavimenta* group; but differs from the latter in the number of supralabials, and from both in the much smaller eye; the large number of ventrals dis-

\* Loc. cit.

tinguishes it at once not only from these Calamarians but from all other species known from the Philippines and in fact from most of the species of the genus. *C. gracillina* from Borneo, exceeds it in having 300 and more ventrals, but it lacks preocular and has no distinct postocular. *C. collaris*, from Celebes, has from 232 to 265 ventrals but has a much larger eye, and a very different style of coloration."

**CALAMARIA TROPICA sp. nov.**

*Type*.—No. 887, E. H. Taylor collection; collected on the low coastal mountains near Naujan, Mindoro, May 2, 1916, by E. H. Taylor.

*Description of type*.—(Juv.) Rostral about as high as broad, well visible above; prefrontals large, not entering eye, laterally in contact with first and second labials, their mutual suture scarcely longer than suture with frontal; latter one and a half times as long as broad, longer than its distance from end of snout, slightly shorter than parietals, more than twice as long and twice as wide as supraoculars; parietals much longer than wide, in contact with postocular and fifth labial; nostril pierced in a minute nasal; a small triangular loreal present, touching second and third labials; a single narrow preocular; postocular a little higher than wide; no anterior temporals; 6 labials, third and fourth entering orbit, fifth largest; mental moderate, not as wide as rostral, in contact with 2 large anterior chin shields, which are nearly twice the length of second pair, second pair of chin shields forming a mutual suture nearly half their length; 5 lower labials, the 3 anterior touching first chin shields; scales in 13 smooth rows; anal single; ventrals 150; subcaudals 19; body cylindrical; tail ending in a blunt point; eye wider than its distance to mouth.

*Color in life*.—Iridescent brown with numerous irregular dark dots; a more or less regular series of yellowish cream dots on outer row of scales, and another, less distinct, on third row; neck with a dark brown bar five scales wide, with a yellow-cream bar one or two scales wide behind it which unites with the yellow-cream ventral color; top of head same as ground color of back with numerous dots and flecks of darker; a yellow-cream irregular line on prefrontal; dark color on upper head, on rostral and upper parts of labials; a very small dark area on upper anterior part of fifth labial; the yellow-cream color on sides fails to meet medially to form a collar in front of dark nuchal bar; chin and belly immaculate; a dark line crosses outer edges of ventrals; a median subcaudal dark line.

*Measurements of Calamaria tropica sp. nov.*

|               | mm. |
|---------------|-----|
| Total length  | 101 |
| Snout to vent | 93  |
| Tail          | 8   |

*Remarks.*—The species is based on a single specimen, the type. The presence of the loreal clearly differentiates it from all other species of *Calamaria*. The unique specimen was collected from under leaves along a forest path on the eastern Mindoro coast.

## SLIGHTLY POISONOUS SNAKES

## BOIGINÆ

Hypapophyses absent in posterior part of vertebral column; nostrils lateral, not valvular; posterior maxillary teeth grooved; somewhat poisonous, but not dangerous to man.

Five genera of the Boiginæ are known in the Philippines and are distinguished as follows:

*Key to the Philippine genera of the Boiginæ.*

- a*<sup>1</sup>. Ventral scales rounded, not keeled or notched; pupil vertically elliptic.
  - b*<sup>1</sup>. Scales with apical pits; head very distinct from neck.
    - Boiga* Fitzinger (p. 195).
  - b*<sup>2</sup>. Scales with apical pits; head not strongly distinct from neck.
    - Psammodynastes* Günther (p. 209).
- a*<sup>2</sup>. Ventral scales strongly keeled and notched; scales with apical pits.
  - b*<sup>1</sup>. Pupil horizontal..... *Dryophiops* Boulenger (p. 213).
  - b*<sup>2</sup>. Pupil round..... *Chrysopelea* Boie (p. 215).
  - b*<sup>3</sup>. Pupil vertically elliptic..... *Dryophis* Dalman (p. 218).

## Genus BOIGA Fitzinger

- Hurria*, part., DAUDIN, Rept. 5 (1803) 275.
- Boiga*, part., FITZINGER, Neue Class. Rept. (1826) 29-31.
- Dipsas*, part., BOIE, Isis (1827) 548; SCHLEGEL, Phys. Serp. 2 (1837) 257; GÜNTHER, Cat. Col. Snakes (1858) 169; JAN, Elenco Sist. Ofid. (1863) 103; GÜNTHER, Rept. Brit. India (1864) 307.
- Dipsadomorphus* FITZINGER, in Tschudi, Faun. Per., Herp. (1845) 55; Syst. Rept. (1843) 27; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 59.
- Macrocephalus* FITZINGER, Syst. Rept. (1843) 27.
- Gonyodipsas* FITZINGER, Syst. Rept. (1843) 27.
- Eudipsas* FITZINGER, Syst. Rept. (1843) 27.
- Cephalophis* FITZINGER, Syst. Rept. (1843) 27.
- Opetiodon* DUMÉRIL and BIBRON, Mem. Ac. Sci. 23 (1853) 494; Erp. Gén. 7 (1854) 905; DUMÉRIL, Prodr. Class. Ophid. (1853) 98.
- Triglyphodon* DUMÉRIL and BIBRON, Mem. Ac. Sci. 23 (1853) 507; DUMÉRIL, Prodr. Class. Ophid. (1853) 111.
- Toxicodryas* HALLOWELL, Proc. Ac. Philadelphia (1857) 60.

- Boiga* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 264; STEJNER, Proc. Biol. Soc. Washington 15 (1902) 16; BARBOUR, Mem. Mus. Comp. Zool. Harv. Coll. 44 (1912) 126.  
*Pappophis* MACLEAY, Proc. Linn. Soc. N. S. W. 2 (1877) 39.  
*Dipsas* BOULENGER, Fauna Brit. India, Rept. (1890) 357.  
*Liophallus* COPE, Proc. Acad. Nat. Sci. Philadelphia (1894) 427.

"Maxillary teeth 10 to 14, subequal in size, followed by two or three enlarged, grooved fangs; anterior mandibular teeth longest. Head very distinct from neck; eye moderate or large, with vertically elliptic pupil; posterior nasal more or less deeply concave. Body more or less compressed; scales smooth, more or less oblique, with apical pits, in 17 to 31 rows, the vertebral row more or less enlarged; ventrals obtusely angulate laterally. Tail moderate or long; subcaudals in two rows." (*Boulenger.*)

The genus is distributed through tropical Africa, southern China, Malay Archipelago, Papuasias, Australia, and Philippines.

*Key to the Philippine species of Boiga Fitzinger.\**

- $\alpha^1$ . Anterior palatine teeth but slightly enlarged.  
 $b^1$ . Snout longer than diameter of eye; scales in 21 rows; body with numerous black and yellow bars..... *B. dendrophila* (Boie) (p. 197).  
 $b^2$ . Snout as long as eye; scales in 19 rows; grayish or yellowish brown, with brown spots and crossbars, the latter extending across belly.  
*B. angulata* (Peters) (p. 204).  
 $\alpha^2$ . Anterior palatine teeth strongly enlarged.  
 $b^1$ . Scales in 19 rows; brownish yellow above with black crossbars.  
*B. philippina* (Peters) (p. 206).  
 $b^2$ . Scales in 23 to 25 rows; head large; body brownish, barred with black, or uniform fawn color without trace of markings.  
*B. cynodon* (Boie) (p. 206).

These snakes are arboreal in habit and, with the exception of the first, rare. The large size of the eyes suggests their nocturnal habits. They prey largely on warm-blooded animals, such as birds and small mammals. The body is elongate, compressed, and the neck is usually slender. *Boiga angulata* and *B. philippina* are restricted to the Philippines; *B. dendrophila* and *B. cynodon* are widely distributed.

These snakes have two or three grooved fangs in the posterior part of the maxillæ. This indicates that they are equipped with poison which probably would prove deadly only to birds and small mammals. There is no record to show that they are deadly to man, and it is almost certain that they are not.

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\* Casto de Elera, Cat. Fauna Filipinas 1 (1895) 446, lists *B. drapeezii* Boie and *B. fusca* Gray from the Philippines, and two unidentified species. The records of the first two are erroneous.

The names *Aguason* and *Agnasan* are applied to *Boiga dendrophila* in the Bicol provinces. In Dapitan it is called *Lilusan*. *Boiga cynodon* is frequently confused with the young pythons by various Mindanao peoples.

#### BOIGA DENDROPHILA (Boie)

*Dipsas dendrophila* BOIE, Isis (1827) 549; WAGLER, Icon. Amph. (1828) pl. 8; Syst. Amph. (1830) 181; SCHLEGEL, Phys. Serp. 2 (1837), 263; pl. 11, figs. 1-3; Abbild. (1844) 133, pl. 45, figs. 1-9; CANTOR, Cat. Mal. Rept. (1847) 76; MOTLEY and DILLWYN, Contr. Nat. Hist. Lab. (1855) 47; GÜNTHER, Cat. Col. Snakes (1858), 169; Rept. Brit. India (1864) 310; Proc. Zool. Soc. London (1879) 78; JAN, Icon. Gén. (1871) 38, pl. 4, fig. 2.

*Dipsas (Dipsas) dendrophila* FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81; BOETTGER, Ber. Senck. Nat. Ges. (1886) 113.

*Triglyphodon dendrophilum* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1086.

*Triglyphodon gemmicinctum* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1091.

*Boiga dendrophila* COPE, Proc. Acad. Nat. Sci. Philadelphia (1860) 264; GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 214; § D 6 (1911) 263; BARBOUR, Mem. Mus. Comp. Zool. Harv. Coll. 44 (1912) 125.

*Dipsas (Triglyphodon) gemmicincta* PETERS, Mqn. Berl. Ak. (1861), 688.

*Dipsadomorphus dendrophilus* (and varieties) BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 70 and 71.

This widely distributed species, which occurs from the Malay Peninsula throughout the East Indian Archipelago, goes through a large number of variations, several of which merit subspecific designation. Boulenger lists seven varieties in his Catalogue; namely, *dendrophila* Boie, *melanotus* Bleeker, *annectens* Boulenger, *regularis* Boulenger, *multicinctus* Boulenger, *gemmicinctus* Duméril and Bibron, and *latifasciatus* Boulenger.

Of these varieties only *dendrophila multicincta* Boulenger and *dendrophila latifasciata* Boulenger occur in the Philippines; the former appear to be confined to Palawan, the latter to Mindanao and Samar. A third form, occurring in Luzon and Samar(?), differs very markedly from *B. dendrophila latifasciata* and probably a little less so from the Palawan form. I propose to give this the subspecific designation *B. dendrophila divergens* subsp. nov.

*Key to the Philippine subspecies of Boiga dendrophila (Boie).*

a. 50 to 58 broad, greenish yellow bands about body and tail; ground color dark black, each scale in the yellow bands edged with black; ventrals, 207 to 222; subcaudals, 93 to 101. Mindanao and Samar.

*B. d. latifasciata* (Boulenger) (p. 198).

$\alpha^2$ . 90 to 110 narrow, yellow bars on body and tail; ground color dark black; ventrals, 220 to 240; subcaudals, 105 to 115.

B. d. *multicincta* (Boulenger) (p. 200).

$\alpha^3$ . 81 to 97 narrow, grayish white bars; ground color dull black washed with gray; young, brownish with a yellow line defining the temporal region. Ventrals, 219 to 228; subcaudals, 80 to 87. Luzon, Samar, Polillo..... B. d. *divergens* subsp. nov. (p. 201).

**BOIGA DENDROPHILA LATIFASCIATA (Boulenger)**

*Dipsadomorphus dendrophilus* var. *latifasciatus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 71.

*Description of subspecies.*—(From No. 18, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, October 10, 1912, by E. H. Taylor.) (Adult male.) Head short and blunt, much widened in parietal region, very distinct from neck; rostral somewhat wider than deep, barely visible from above, its sutures with internasals and nasals subequal; internasals broader than long, not touching loreal, little shorter than prefrontals; latter broader than long, in contact with loreal and nasal, forming their smallest sutures with the former; frontal seven-eighths as wide as long, broader than supraoculars but of equal length, as long as or a little longer than its distance from end of snout, its anterior suture a continuous straight line; parietals large, much longer than wide, their width equaling length of frontal; a slightly enlarged transverse row of scales bordering labials, temporals, and parietals posteriorly; nostril large, between 2 nasals; loreal small, triangular, longer than wide, not entering eye; preocular large, widely separated from frontal, visible from above; supraocular little longer than wide; 2 postoculars, inferior largest; temporals 2 + 3 (on the right side the lower is crowded back somewhat, and only 1 temporal touches postoculars); 8 upper labials, third, fourth, and fifth entering eye; seventh largest; sixth on right side is broken horizontally; mental twice as wide as deep; 10 lower labials, 4 in contact with anterior chin shields which are much longer and broader than second pair; a small, third pair of chin shields; eye large, its diameter equal to its distance from anterior border of nostril; ventrals, 210; anal single; subcaudals, 98 pairs; body much compressed.

*Color in life.*—Coal black above with 60 greenish yellow bands around body, each yellow scale bordered with black; the bands crossing belly usually the width of three ventrals; about 16 of these bands belong to tail and do not extend entirely across ventral surface; on posterior part of body they do not cross entirely; first 24 ventrals on neck yellow, narrowly edged with

black; upper and lower labials and scales under head yellow edged with black. Top of head black; 1 or 2 yellow spots on parietals, and posterior to and in front of eye are other spots of yellow.

*Measurements of Boiga dendrophila latifasciata (Boulenger).*

|                |       |
|----------------|-------|
|                | mm.   |
| Total length   | 1,215 |
| Snout to vent  | 962   |
| Tail           | 253   |
| Width of head  | 23    |
| Length of head | 31    |

*Variation.*—The known range of ventrals in this subspecies is 207 to 222; of subcaudals, 93 to 101. In three specimens the loreal is absent; in no case is the loreal found entering eye. This subspecies usually has 3 pairs of chin shields. Only one

TABLE 38.—*Measurements and scale counts of Boiga dendrophila latifasciata (Boulenger).*

| No.  | Locality.       | Collector.   | Sex or age. | Length. | Tail. | Ventrals. | Subcaudals. | Anal. |
|------|-----------------|--------------|-------------|---------|-------|-----------|-------------|-------|
|      |                 |              |             | mm.     | mm.   |           |             |       |
| 18   | Bunawan, Agusan | E. H. Taylor | ♂           | 1,215   | 253   | 210       | 98          | 1     |
| 19   | do              | do           | ♀           | 708     | 137   | 207       | 93          | 1     |
| 20   | do              | do           | ♂           | 1,020   | 217   | 211       | 97          | 1     |
| 21   | do              | do           | ♀           | 960     | 206   | 218       | 101         | 1     |
| 22   | do              | do           | yg          | 650     | 125   | 213       | 101         | 1     |
|      | Mindanao        |              | ♀           |         |       | 210       | 94          | 1     |
| 1727 | Bunawan, Agusan | E. H. Taylor | yg          |         |       |           |             | 1     |

| No.  | Chin shields. | Preoculars. | Postoculars. | Upper labials. | Labials entering eye. | Lower labials. | Loreals. | Loreal entering eye. | Temporals. | Scale rows. | Collection.        |
|------|---------------|-------------|--------------|----------------|-----------------------|----------------|----------|----------------------|------------|-------------|--------------------|
|      | Pairs.        |             |              |                |                       |                |          |                      |            |             |                    |
| 18   | 3             | 1           | 2            | 8              | 3, 4, 5               | 10             | 1        | 0                    | 2+3        | 21          | E. H. Taylor.      |
| 19   | 2             | 1           | 2            | 8              | 3, 4, 5               | 10             | 1        | 0                    | 2+3        | 21          | Do.                |
| 20   | 3             | 1           | 2            | 8              | 3, 4, 5               | 10-11          | 1        | 0                    | 2+3        | 21          | Do.                |
| 21   | 3             | 1           | 2            | 8              | 3, 4, 5               | 10             | 0        | 0                    | 2+3        | 21          | Do.                |
| 22   | 2             | 1           | 2            | 8              | 3, 4, 5               | 10             | 1        | 0                    | 2+3        | 21          | Do.                |
|      | 3             | 1           | 2            | 8              | 3, 4, 5               | 10             | 0        | 0                    | 2+3        | 21          | Santo Tomás.       |
| 1727 | 3             | 1           | 2            | 8              | 3, 4, 5               | 11             | 0        | 0                    | 2+3        | 21          | Bureau of Science. |

specimen, the one described, shows the tendency of the sixth and seventh upper labials to break; in the other subspecies this tendency is very pronounced.

*Remarks.*—This subspecies is common at Bunawan, Agusan, Mindanao. A number of specimens taken were lost, and many

seen were not taken. The snake was always found in low brush and trees, invariably away from the ground. It makes no or very little effort to fight. One specimen taken had just eaten a bat. This subspecies is probably confined to Mindanao and the near-by islands. Samar apparently has two forms of the species. Boettger reports a specimen of *Boiga dendrophila latifasciata* from there, and there is a specimen of *B. dendrophila divergens* in the Santo Tomás Museum presumably from Samar.

**BOIGA DENDROPHILA MULTICINCTA (Boulenger)**

PLATE 25; PLATE 26, FIGS. 4 TO 6

*Dipsadomorphus dendrophilus* var. *multicinctus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 71.

*Boiga dendrophila multicincta* BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 125.

*Description of subspecies.*—Similar to *Boiga dendrophila latifasciata*, but with a higher number of ventrals and subcaudals; ventrals vary between 220 and 240, the average being 231; subcaudals vary between 105 and 115, the average being 111; there are 11 instead of 10 lower labials; there is a decided tendency for the seventh labial to break horizontally, thus in eight of the thirteen specimens examined this division has occurred; there are only 2 pairs of chin shields present, and the number of labials touching the first pair is 4 or 5. One specimen has the loreal entering the eye below the preocular.\* The temporal elements frequently assume the position represented by the formula  $\frac{2}{1} + 3$ .

*Color.*—Body above black with a large series of narrow yellowish to yellowish white bars on body and tail; the number of bars varies from 93 to 111, the average being 106; these light bars are seldom more than 1 scale wide.

*Measurements of Boiga dendrophila multicincta (Boulenger), No. 906, Bureau of Science collection.*

|               | mm.   |
|---------------|-------|
| Total length  | 1,160 |
| Snout to vent | 900   |
| Tail          | 260   |

*Remarks.*—This subspecies is common in Palawan and in Balabac; I obtained the specimens in my own collection from the latter locality. These do not differ from those found on the Palawan mainland.

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\* Boulenger records this same anomaly on a specimen in the British Museum, op. cit. 70.

TABLE 39.—Measurements and scale counts of *Boiga dendrophila multicincta* (Boulenger).

| No.  | Locality.       |  |  | Collector.    | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Anal. | Chin shields. | Preoculars. |
|------|-----------------|--|--|---------------|------|---------|-------|-----------|-------------|-------|---------------|-------------|
|      |                 |  |  |               |      | mm.     | mm.   |           |             |       | prs.          |             |
| 7    | Iwahig, Palawan |  |  | W. Schultze   | ♀    | 1,360   | 290   | 228       | 105         | 1     | 2             | 1           |
| 568  | do              |  |  | C. M. Weber   | ♀    | 1,410   | 325   | 231       | 113         | 1     | 2             | 1           |
| 656  | do              |  |  | do            | ♂    | 1,350   | 280   | 220       | 113         | 1     | 2             | 1           |
| 676  | do              |  |  | do            | ♀    | 1,120   | 250   | 237       | 113         | 1     | 2             | 1           |
| 701  | do              |  |  | do            | ♀    | 1,040   | 215   | 237       | 113         | 1     | 2             | 1           |
| 906  | do              |  |  | C. H. Lamb    | ♀    | 1,160   | 260   | 229       | 113         | 1     | 2             | 1           |
| 917  | do              |  |  | do            | ♀    | 1,102   | 250   | 229       | 113         | 1     | 2             | 1           |
| 918  | do              |  |  | do            | ♀    | 1,400   | 285   | 240       | 106         | 1     | 2             | 1           |
| 919  | do              |  |  | do            | ♀    | 1,400   | 290   | 231       | 111         | 1     | 2             | 1           |
| 1367 | do              |  |  | P. Gilman     | ♂    | 680     | 146   | 233       | 115         | 1     | 2             | 1           |
| 1338 | do              |  |  | C. Canonizado | ♂    | 1,270   | 300   | 221       | 111         | 1     | 2             | 1           |

| No.  | Postoculars. | Upper labials. | Labials enter eye.  | Lower labials. | Labials touch chin shields. | Loreals. | Loreal enters eye. | Temporals.  | Scale rows. | Yellow bars. | Collection.        |  |
|------|--------------|----------------|---|----------------|-----------------------------|----------|--------------------|---|-------------|--------------|--------------------|--|
| 7    | 2            | 8              | 3, 4, 5   | 11             | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 104          | Bureau of Science. |  |
| 568  | 2            | 8              | 3, 4, 5   | 11             | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 103          | Do.                |  |
| 656  | 2            | 8              | 3, 4, 5   | 10-11          | 4                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2+3 \\ 2+2 \end{smallmatrix} \right\}$ | 21          | 104          | Do.                |  |
| 676  | 2            | 8              | 3, 4, 5   | 11             | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 2 \right\}$ | 21          | 111          | Do.                |  |
| 701  | 2            | 8              | 3, 4, 5   | 11             | 4                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 100          | Do.                |  |
| 906  | 2            | 8              | 3, 4, 5   | 10-11          | 4                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 111          | Do.                |  |
| 917  | 2            | 8              | 3, 4, 5   | 11             | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 110          | Do.                |  |
| 918  | 2            | 8-9            | $\left\{ \begin{smallmatrix} 3, 4, 5 \\ 4, 5, 6 \end{smallmatrix} \right\}$ | 11-11          | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 111          | Do.                |  |
| 919  | 2            | 8-9            | 3, 4, 5   | 11-11          | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 109          | Do.                |  |
| 1367 | 2            | 8              | 3, 4, 5   | 11             | 4                           | 1        | Yes                | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 110          | Do.                |  |
| 1338 | 2            | 8              | 3, 4, 5   | 11             | 5                           | 1        | No                 | $\left\{ \begin{smallmatrix} 2 \\ 1 \end{smallmatrix} + 3 \right\}$ | 21          | 93           | Do.                |  |

## BOIGA DENDROPHILA DIVERGENS subsp. nov.

*Type*.—No. 186, E. H. Taylor collection; collected on Mount Maquiling, Laguna, Luzon, November 12, 1913, by E. H. Taylor.

*Description of type*.—Head large, blunt, double the width of neck; rostral a little wider than high, forming its smallest sutures with first labials; internasals rather small, about half as large as prefrontals; latter forming their smallest suture with loreal, their longest with frontal, their mutual suture deep; frontal with anterior suture forming a straight line, sides round-

ing instead of angular; wider than supraocular and about the same length; parietals large, longer than wide, very much larger than frontal, in contact laterally with one temporal and upper postocular; supraoculars much wider behind than anteriorly, broadly in contact with prefrontals; nasal divided, the anterior part quadrangular, lower than posterior; nostril large; loreal small, narrowly entering eye below preocular, touching 2 labials; preocular higher than wide; eye large, equal to its distance from middle of nostril; 2 postoculars, upper slightly the larger; temporals,  $2 + 2$ ; 8 upper labials, third, fourth, and fifth broadly entering orbit; labials in the following order of size; seventh, sixth, eighth, fifth, third, fourth, second, first; mental small, as wide as rostral; 10 lower labials, 5 touching anterior chin shields, which are double the size of second pair; third pair of chin shields small; mental groove very deep; scales in 21 rows around body; ventrals, 228; anal single; subcaudals, 80 pairs.

*Color in life.*—Above bluish, the larger part of the scales with a wash of light gray-ultramarine, more pronounced on posterior part of body; back with 63 narrow, bluish white, transverse bands extending to edge of ventrals where they widen slightly and are more yellowish in color on belly; tail with 16 bands; yellowish dots on supraoculars and prefrontals; a row of bluish white dots outlines the posterior temporal region; upper and lower labials each with a large yellowish white area enclosed with black, except on border of mouth; lateral head scales with light spots; anterior ventrals and chin scales yellowish edged with black.

*Measurements of Boiga dendrophila divergens subsp. nov.*

|                | mm.   |
|----------------|-------|
| Total length   | 1,370 |
| Snout to vent  | 1,114 |
| Tail           | 256   |
| Width of head  | 27    |
| Length of head | 35    |

*Variation.*—Two specimens in the Bureau of Science collection from Polillo\* show the following variations from the type: The loreal in both specimens is smaller and does not enter eye; the temporal formula of one is  $2 + 3$  and  $\frac{2}{1} + 3$  and of the other,  $2 + 3$ ; in one specimen there are four labials touching the first chin shields, in the other (a young one) five; the ground color is brown, darker on anterior part of body; the transverse

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\* Griffin, Philip. Journ. Sci. § D 5 (1910) 214.

bars are yellowish white and encircle body on anterior part; belly grayish brown; there are yellow spots on all the head scales except frontal, those in front of eye prominent; a line begins on eye and runs along edge of parietal and around temporal region to labials; two small posterior branches run a short distance on neck. There is a specimen in the Santo Tomás Museum, presumably from Samar.

*Remarks.*—This subspecies is probably more closely related to the Palawan *Boiga dendrophila multicincta* than to the Mindanao *B. dendrophila latifasciata*. The number of ventrals varies between 219 and 228; of subcaudals, between 80 and 87; the ventrals average 223, 8 less than in *B. dendrophila multicincta*, and the subcaudals average 83, which is 28 less than in *B. dendrophila multicincta*; 10 is the usual number of lower labials. None of the specimens examined shows the seventh labial broken. The difference in color, the markings in the temporal region, and the smaller number of subcaudals suffice to distinguish this form from the other two Philippine subspecies.

TABLE 40.—Measurements and scale counts of *Boiga dendrophila divergens* subsp. nov.

| No. | Locality. | Collector.    | Sex or age. | Length.   | Tail.            | Ventrals. | Subcaudals.      | Anal. | Preoculars. | Loreal enters eye. |
|-----|-----------|---------------|-------------|-----------|------------------|-----------|------------------|-------|-------------|--------------------|
| 186 | Laguna    | E. H. Taylor  | ♀           | mm. 1,370 | mm. 256          | 228       | 80               | 1     | 1           | Yes.               |
| 805 | Polillo   | C. Canonizado | ♂           | 1,128     | <sup>a</sup> 140 | 223       | <sup>a</sup> 47  | 1     | 1           | No.                |
| 806 | do        | do            | yg          | 375       | 74               | 223       | 87               | 2     | 1           | No.                |
|     | Samar     |               | ♂           |           |                  | 222       | <sup>a</sup> 84  | 1     | 1           | Yes.               |
|     | Manila    |               | ♂           |           |                  | 219       | ( <sup>a</sup> ) | 1     | 1           | No.                |

| No. | Labials. |  |            |                     | Temporals.   | Scale rows. | White bars.     | Collection.        |
|-----|----------|--|------------|---------------------|--|-------------|-----------------|--------------------|
|     | Upper.   | Lower.   | Enter eye. | Touch chin shields. |  |             |                 |                    |
| 186 | 8        | 10   | 3, 4, 5    | 5                   | 2+2  | 21          | 79              | E. H. Taylor.      |
| 805 | 8        | 10   | 3, 4, 5    | 4                   | $\left\{ \begin{array}{l} 2 \\ 1 \end{array} + 3 \right\}$ | 21          | <sup>a</sup> 83 | Bureau of Science. |
| 806 | 8        | 10   | 3, 4, 5    | 5                   | $\left\{ \begin{array}{l} 2+3 \\ 2+3 \end{array} \right\}$ | 21          | 98              | Do.                |
|     | 8        | $\left\{ \begin{array}{l} 11 \\ 10 \end{array} \right\}$ | 3, 4, 5    | 4                   | 2+3  | 21          | 93              | Santo Tomás.       |
|     | 8        | 10   | 3, 4, 5    | 5                   | 2+3  | 21          | 86              | Do.                |

<sup>a</sup> Tail mutilated.

## BOIGA ANGULATA (Peters)

PLATE 26, FIGS. 1 TO 3; PLATE 27

- Dipsas* (*Dipsadomorphus*) *angulata* PETERS, Mon. Berl. Ak. (1861) 688; BOETTGER, Ber. Senck. Nat. Ges. (1886) 113; (1892) XLIX.
- Dipsas* (*Eudipsas*) *guiraois* \* STEINDACHNER, Novara, Rept. (1867) 75, pl. 3, figs. 9, 10; BOETTGER, Ber. Senck. Nat. Ges. (1886) 113; F. MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 18; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81.
- Dipsadomorphus angulatus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 75.
- Boiga angulata* GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 213; § D 6 (1911) 263; TAYLOR, Philip. Journ. Sci. § D 12 (1917) 366.

*Description of species.*—(From No. 271, Bureau of Science collection; collected on Mount Marapara, Occidental Negros, September, 1909, elevation, 715 meters, by F. W. Foxworthy.) (Adult male.) Head short, rather thick, but little longer than wide; supraocular region prominent; diameter of eye minutely shorter than its distance from end of snout; rostral distinctly broader than high, scarcely visible from above, forming its longest suture with nasal; internasals small, their surface rounding, truncate anteriorly, broader than long; prefrontals broader than long, with a distinct depression at posterior end of their common suture; frontal as long as wide, slightly shorter than its distance from end of snout, a little wider than supraoculars, not in contact with preocular, its anterior suture forming a straight line; parietals slightly longer than broad, a little longer than frontal, in contact with 1 postocular, their edges irregular; nasal large, followed by a very small loreal, higher than wide; 1 preocular, elongate, wider at top than bottom; 2 postoculars, upper largest; temporals 2 + 2, the upper anterior touching both postoculars; 8 upper labials, third, fourth, and fifth entering eye; mental as wide as rostral, very short; 10 lower labials, 5 touching first chin shields, which are much longer and wider than posterior pair; scales in 19 rows, smooth, distinctly angular on body, with the median row enlarged; median laterals very small; scales on neck much elongate, narrow, and pointed; ventrals, 267; anal single; subcaudals, 152; body very slender, compressed; neck very long, extremely narrow, less than one-third the width of head.

*Color in alcohol.*—Above a light yellow brown, with a large series of dim, darker brown, transverse bands or blotches which widen laterally and are discernible on belly; a series of large lighter spots along edges of ventrals; belly strongly marked with

\* I follow Boulenger in regarding this a synonym of *Boiga angulata*.

darker, elongate, brown spots, arranged in two broken lines on ventrals; head brownish flecked with darker; upper labials light, throat and chin muddy white.

*Measurements of Boiga angulata (Peters).*

|                | mm.   |
|----------------|-------|
| Length         | 1,477 |
| Snout to vent  | 1,107 |
| Tail           | 370   |
| Length of head | 18    |
| Width of head  | 15    |

*Variation.*—A second specimen from Polillo \* is at hand. It agrees very well in scalation with the one described. The bars on body and the ground color above are darker; below there are fewer dark spots, and no traces of the dark line noted in the described specimen. The frontal in the second specimen is as long as or a little longer than its distance from end of snout. The known ventral range of the species is from 254 to 267; subcaudal

TABLE 41.—*Measurements and scale counts of Boiga angulata (Peters).*

| No.   | Locality. | Collector.      | Sex. | Length.<br>mm. | Tail.<br>mm. | Ventrals. | Subcaudals. | Anal. | Upper labials. |
|-------|-----------|-----------------|------|----------------|--------------|-----------|-------------|-------|----------------|
| 271   | Negros    | F. W. Foxworthy | ♂    | 1,477          | 370          | 267       | 152         | 1     | 8              |
| ■ 789 | Polillo   | C. Canonizado   | ♀    | 1,105          | 260          | 260       | ■ 120       | 1     | 8              |
|       | Los Baños | Unknown         | ♂    | 1,005          | 275          | 263       | 147         | 1     | 8              |
| (b)   | Leyte     | F. Jagor        |      | 1,015          | 240          | 254       | 126         | 1     | 8              |

| No.   | Labials<br>enter eye. | Lower la-<br>bials. | Labials<br>touch chin<br>shields. | Preocu-<br>lars. | Postocu-<br>lars. | Tempo-<br>rals. | Scale<br>rows. | Collection.             |
|-------|-----------------------|---------------------|-----------------------------------|------------------|-------------------|-----------------|----------------|-------------------------|
| 271   | 3, 4, 5               | 10                  | 5                                 | 1                | 2                 | 2+2             | 19             | Bureau of Science.      |
| ■ 789 | 3, 4, 5               | 10-11               | 6                                 | 1                | 2                 | 2+2             | 19             | Do.                     |
|       | 3, 4, 5               | 10                  | 5                                 | 1                | 2                 | 2+1+3           | 19             | College of Agriculture. |
| (b)   | 3, 4, 5               |                     |                                   | 1                | 2                 |                 | 19             | Berlin ?                |

\* Tail slightly mutilated and part missing.

♢ Type, data from Peters, Mon. Berl. Ak. (1861) 688.

range, from 126 to 152. The type is said to have a divided nasal. In the specimen I have described the nasal has a slight depression or suture partly dividing it; the second specimen shows no suture or depression.

\* Griffin, Philip. Journ. Sci. § D 5 (1910) 214, makes note of the variation of this specimen, and records the fact that the stomach contained a large *Calotes*.

The type is from Leyte, collected by F. Jagor. Specimens have been taken also in Polillo, Negros, and Catanduanes.

#### BOIGA PHILIPPINA (Peters)

*Dipsas philippina* PETERS, Mon. Berl. Ak. (1867) 27; BOETTGER, Ber. Senck. Nat. Ges. (1886) 113.

*Dipsadomorphus philippinus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 77.

*Boiga philippina* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 263.

*Description of species.*—(After the type description.) Anterior palatine and mandibular teeth strongly enlarged; head very broad; neck narrow; rostral broader than deep, just visible from above; internasals broader than long, much shorter than prefrontals; frontal as long as broad, or a little longer, as long as its distance from rostral; loreal about as long as deep; 2 preoculars, upper in contact or nearly in contact with frontal; 2 postoculars; temporals variable; 8 upper labials, third, fourth, and fifth entering eye; 12 lower labials; scales in 19 rows, vertebral row hexagonal and strongly enlarged; ventrals, 240; anal divided; subcaudals, 133.

*Color.*—Brownish yellow above, with black crosslines; head spotted with black, but no temporal streak present.

#### *Measurements of Boiga philippina (Peters).*

|               | mm. |
|---------------|-----|
| Total length  | 690 |
| Snout to vent | 535 |
| Tail          | 155 |
| Head length   | 20  |

*Remarks.*—I have been unable to obtain a specimen of this rare reptile. The type locality is "Ylases,\* Northwest Luzon," collected by Semper. It is known only from the type.

#### BOIGA CYNODON (Boie)

*Dipsas cynodon* BOIE, Isis (1827) 559; GUÉRIN, Icon. Reg. Anim. Rept. (1829) pl. 21, fig. 2; SCHLEGEL, Phys. Serp. 2 (1837) 268, pl. 11, figs. 10 and 11; GÜNTHER, Rept. Brit. India (1864) 308; JAN, Icon. Gén. (1871) 38, pl. 6, fig. 1; SCLATER, Journ. As. Soc. Bengal 60 (1891) 244; BOETTGER, Abh. Mus. Dresden No. 7 (1894-95) 4.

*Dipsas cynodon*, part., CANTOR, Cat. Mal. Rept. (1847) 77.

*Opetiodon cynodon* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 907.

*Eudipsas cynodon* GÜNTHER, Cat. Col. Snakes (1858) 168.

*Pareas waandersii* BLEEKER, Nat. Tijds. Nederl. Ind. 21 (1860) 471.

*Dipsas (Eudipsas) cynodon* BOETTGER, Ber. Senck. Nat. Ges. (1886) 113; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 435.

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\* Probably a misspelling of Ilocos (or Ylocos as the name was formerly spelled), a province in Luzon.

*Dipsadomorphus cynodon* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 78.

*Boiga cynodon* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 599; § D 5 (1910) 213; § D 6 (1911) 264.

*Description of species.*—(From No. 88, Bureau of Science collection; collected at Iwahig, Palawan, March, 1909, by W. Schultze.) (Adult male.) Anterior palatine and mandibular teeth very strongly enlarged; head large, distinct from neck; rostral scarcely visible above, broader than deep, forming its longest suture with nasal, its shortest with first labial; internasals broader than long, curving downward on sides, rather narrowed in front, their mutual suture little more than half that between prefrontals; latter very much larger than internasals, forming their shortest sutures with nasals and supraoculars, broader than long, a little shorter than frontal; latter about five-sixths as wide as long, shorter than its distance from rostral, little wider than supraoculars; parietals very little longer than wide, in contact with upper postocular, nasal divided, nostril large; loreal present, longer than high; preocular single, very high, visible above, touching only fourth labial below; 2 postoculars, subequal in size; temporals 3 + 2; 9 upper labials, fourth, fifth, and sixth entering eye, eighth largest; mental much broader than deep; 13 and 14 lower labials, 5 touching anterior chin shields which are much smaller than second pair; 5 labials touching second pair of chin shields; scales with apical pits, in 23 rows around body, the outer ventral row strongly enlarged; ventrals 268; anal single; subcaudals 149; eye very large, its diameter about equal to its distance from nostril; body very strongly compressed; neck long and slender.

*Color in alcohol.*—Above yellowish to dark brown with about 44 more or less distinct transverse bands on body, and about 35 on tail where they are wider and are separated by only a very narrow interspace; bars distinct on neck; head dark brown without spots; a distinct black line from eye to angle of jaw; below, immaculate on chin, throat, and belly; muddy under tail.

*Measurements of Boiga cynodon (Boie).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,915 |
| Snout to vent  | 1,450 |
| Tail           | 465   |
| Width of head  | 22    |
| Length of head | 36    |
| Width of neck  | 10    |
| Width of body  | 15    |

*Variation.*—A second specimen (No. 89) in the collection of the Bureau of Science agrees with the described form in scala-

tion, and is almost identical in color and markings. A third specimen, in my own collection, differs from the described form as follows: In my specimen the black blotches are very much wider inclosing elongate grayish spots ventrally, about 28 on body and about an equal number on tail. Head has 2 small spots on frontal and another spot on each parietal; the black line behind eye is present. Below, body is muddy yellow with a series of irregular black blotches along both sides of ventrals; below, tail is dark, variegated with lighter spots. Width of head is 32 millimeters; length of head, 45. There are 14 and 15 lower labials; the loreal is nearly twice as long as wide; the diameter of eye is less than its distance to nostril.

TABLE 42.—Measurements and scale counts of *Boiga cynodon* (Boie).

| No.   | Locality.        | Collector.    | Sex. | Length.<br>mm. | Tail.<br>mm. | Ventrals. | Subcaudals. | Anal. |
|-------|------------------|---------------|------|----------------|--------------|-----------|-------------|-------|
| 88    | Palawan          | W. Schultze   | ♂    | 1,915          | 465          | 268       | 149         | 1     |
| 90    | Poliillo         | C. Canonizado | ♂    | 1,590          | 398          | 269       | 143         | 1     |
| 253   | Bunawan, Agusan  | E. H. Taylor  | ♂    | 2,020          | 465          | 263       | 141         | 1     |
| 89    | Philippines      | C. H. Lamb    | ♀    | 1,725          | 425          | 279       | 153         | 1     |
| ----- | Los Baños, Luzon | do            | ♀    | 1,065          | 240          | 271       | 135         | 1     |

| No.   | Preoculars. | Postoculars. | Upper labials. | Labials entering eye. | Lower labials. | Labials touch chin shields. | Scale rows. | Collection.             |
|-------|-------------|--------------|----------------|-----------------------|----------------|-----------------------------|-------------|-------------------------|
| 88    | 1           | 2            | 9              | 4, 5, 6               | 13-14          | 4-5                         | 23          | Bureau of Science.      |
| 90    | 1           | 2            | 9              | 4, 5, 6               | 14-15          | 4-5                         | 23          | Do.                     |
| 253   | 1           | 2            | 9              | 4, 5, 6               | 14             | 6-5                         | 23          | E. H. Taylor.           |
| 89    | 1           | 2            | 9              | 4, 5, 6               | 14-15          | 5-6                         | 23          | Bureau of Science.      |
| ----- | 1           | 2            | 8-9            | 3, 4, 5; 4, 5, 6      | 15-13          | 4-5                         | 23          | College of Agriculture. |

There is a single fawn-colored form in the Bureau of Science collection (No. 90). It has no markings of any kind. In the size of the head, in body proportions, and in scalation it agrees with the two specimens recorded above.

The known variation of ventrals in Philippine specimens is 261 to 279; of subcaudals, 129 to 153. The range for the species given in Boulenger's Catalogue\* is 248 to 290 and 114 to 156 for the ventrals and subcaudals, respectively. The temporals range from 2 + 2 and 2 + 3 to 3 + 3 and 3 + 4. The upper labials vary from 8 to 10, and there is consequent variation in the number of labials entering the eye. The species attains a length of more than 2 meters.

\* Loc. cit.

*Remarks.*—This snake is rare in the Philippines. Boulenger lists a single specimen from the Philippines, in the Cuming collection. A specimen is in the collection of the College of Agriculture at Los Baños, Luzon; the stomach of this one contained a bird. In the Philippines it is known from Polillo, Luzon, Culion, Mindanao, Leyte, and Palawan. Outside of the Philippines it is known from Burma, Malay Peninsula, Borneo, Sumatra, and Nias.

Genus **PSAMMODYNASTES** Günther

*Psammophis*, part., BOIE, Isis (1827) 521; SCHLEGEL, Phys. Serp. 2 (1837) 201; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 887; PETERS, Mon. Berl. Ak. (1868) 452.

*Psammodynastes* GÜNTHER, Cat. Col. Snakes (1858) 140; JAN, Elenco Sist. Ofid. (1863) 90; GÜNTHER, Rept. Brit. India (1864) 292; MOCQUARD, Bull. Soc. Philom. VII 11 (1887) 172; BOULENGER, Fauna Brit. India, Rept. (1890) 363; Cat. Snakes Brit. Mus. 3 (1896) 172; BOETTGER, Ber. Senck. Nat. Ges. (1886) 110; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 432.

*Thamnodynastes* WERNER, Abh. Bayer Akad. Wiss. II. Klasse 22 (1904) 372.

*Anisodon* ROSÉN, Ann. & Mag. Nat. Hist. VII 15 (1905) 176.

*Anisodontes* ROSÉN, Ann. & Mag. Nat. Hist. VII 16 (1905) 128.

"Maxillary teeth 9 to 11, third or third and fourth much enlarged, fang-like, followed by a short interspace, last enlarged and grooved; anterior mandibular teeth strongly enlarged. Head distinct from neck, with angular canthus rostralis; eye rather large, with vertically elliptic or subelliptic pupil; nostril in a single nasal; frontal very narrow. Body cylindrical; scales smooth, without pits, in 17 or 19 rows; ventrals rounded. Tail moderate or rather short; subcaudals in two rows." (*Boulenger.*)

The genus has two species, *Psammodynastes pulverulentus* (Boie) and *P. pictus* Peters. Only the former has been found in the Philippines.

Snakes of this genus are probably slightly poisonous, but certainly not deadly to man. They rarely exceed half a meter in length.

**PSAMMODYNASTES PULVERULENTUS** (Boie)

*Psammophis pulverulenta* BOIE, Isis (1827) 547; SCHLEGEL, Phys. Serp. 2 (1837) 211, pl. 8, figs. 10 and 11; Abbild. (1844) pl. 43, figs. 1-4; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 895.

*Dipsas ferruginea* CANTOR, Proc. Zool. Soc. London (1839) 53; BLYTH, Journ. As. Soc. Bengal 23 (1854) 293; 24 (1855) 715.

*Psammodynastes pulverulentus*, part., GÜNTHER, Cat. Col. Snakes (1858) 140.

- Psammodynastes pulverulentus* GÜNTHER, Cat. Col. Snakes (1858) 251; Rept. Brit. India (1864) 292; Zool. Rec. (1867) 188; PETERS, Mon. Berl. Ak. (1861) 687; THEOBALD, Cat. Rept. Brit. India (1876) 188; FISCHER, Arch. Nat. (1885) 62; Jahrb. wiss. Anst. Hamburg 2 (1885) 81; MOCQUARD, Bull. Soc. Philom VII 11 (1887) 172, pl. 3; 12 (1888) 104; F. MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 17; BOETTGER, Ber. Senck. Nat. Ges. (1886) 110; BOULENGER, Fauna Brit. India, Rept. (1890) 363; Cat. Snakes Brit. Mus. 3 (1896) 172; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 383, figs. 317–319; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600; § D 5 (1910) 214; § D 6 (1911) 264.
- Psalmodynastes pulverulentus* TAYLOR, Philip. Journ. Sci. § D 12 (1917) 366; § D 13 (1918) 260 (typ. err.).
- Lycodon bairdi* STEINDACHNER, Novara Exped. Zool. I. Rept. (1867) 90 (type locality, Philippines).
- Anisodon liljeborgi* ROSÉN, Ann. & Mag. Nat. Hist. VII 15 (1905) 176, pl. 11, fig. 3.

*Description of species.*—(From No. 79, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, October 1, 1912, by E. H. Taylor.) Rostral wider than high, visible from above as a narrow line, the suture with internasals shortest, that with

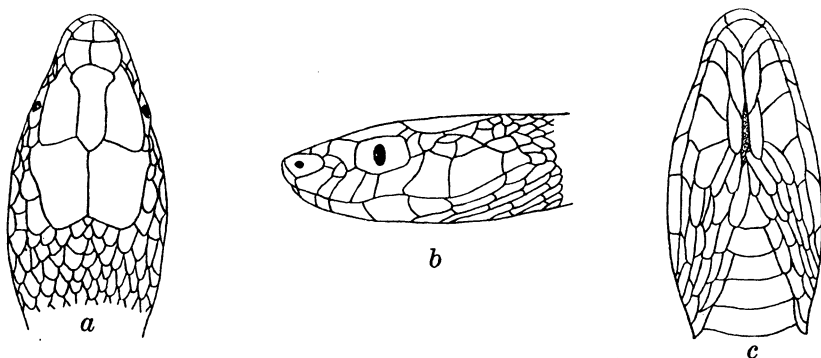


FIG. 18. *Psammodynastes pulverulentus* (Boie); after Stejneger; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

nasal longest; internasals small, triangular, less than half the size of prefrontals; latter large, in contact with loreal, preocular, and nasal; frontal elongate, much longer than wide, longer than its distance from end of snout, shorter than parietals, a little wider than supraoculars, its sides concave, pointed behind; parietals large, longer than wide; nasal longer than deep, nostril pierced near middle; loreal small, irregular, touching 2 labials; 2 preoculars, the upper five times as large as the lower, visible from above only as a point; supraocular large, broadly in contact with prefrontal and preocular, much larger than frontal, projecting out over eye, its edge continuous with the rather

sharp canthus rostralis; 2 postoculars, the inferior largest; temporals irregular, only a single temporal in contact with postoculars; the formulæ are: right side,  $\frac{2}{1} + 2$ ; left side,  $2 + 2$ ; 8 upper labials, third, fourth, and fifth entering eye, seventh and eighth largest; 7 lower labials, three in contact with first pair of chin shields; 3 pairs of chin shields; lips slightly puffed out; preocular region concave; scale rows, 17, all smooth; ventrals, 170; anal single; subcaudals, 53.

*Color in life.*—Dark ash color above with a series of irregular blotches extending to end of body. The blotches are somewhat lighter than the surrounding ground color, and usually involve two or three very dark scales; tail a much lighter ash color, showing the blotches indistinctly; below grayish, with a heavy powdering of minute brownish spots; neck with various light dots which continue at irregular intervals along body; head markings very indistinct; a brilliant orange spot on each of the six chin shields, and a similar spot on sixth labial.

*Measurements of Psammodynastes pulverulentus (Boie)*

|               | mm. |
|---------------|-----|
| Total length  | 575 |
| Snout to vent | 472 |
| Tail          | 103 |

*Variation.*—The scale variations in this species are numerous; this is especially true of the lateral head scales. The loreals vary between 1 and 2; preoculars, 1 and 2; postoculars, between 1 and 3. For the most part there are 3 pairs of chin shields, yet in the large series examined many specimens were found with only 2. No considerable series from any particular island or locality has been obtainable. Six specimens recently examined from Balabac Island, just north of Borneo, show the following characteristics: Five have 3 postoculars, one has 2; four have 1 loreal, two have 2; four have 3 pairs of chin shields, two have 2. These variations are apparently normal. All six specimens vary widely in color and markings. I do not believe it will be possible to separate any subspecific forms on the basis of color or scale variation.

The ventrals in the Philippine specimens examined range from 151 to 173; the subcaudals, from 53 to 69. Stejneger \* gives 146 to 175, and 44 to 66 as the known range of the ventrals and subcaudals, respectively.

The coloration, especially the ground color, varies greatly. Certain specimens are grayish brown with large, transverse,

\* Loc. cit.

angular ashy spots of lighter color. Others are yellowish brown, the edges of the scales edged with brick red, and with blackish reticulations. Still others are dark with the underpart of the head dark black with brilliant orange spots, and so on. There seems to be no limit to the variations possible.

TABLE 43.—Measurements and scale counts of *Psammodynastes pulverulentus* (Boie).

| No.  | Locality.             |  |  |  |  | Collector.       |  |  |  |  | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Anal. |
|------|-----------------------|--|--|--|--|------------------|--|--|--|--|------|---------|-------|-----------|-------------|-------|
|      |                       |  |  |  |  |                  |  |  |  |  |      | mm.     | mm.   |           |             |       |
| 79   | Bunawan, Agusan       |  |  |  |  | E. H. Taylor     |  |  |  |  | ♀    | 575     | 103   | 170       | 53          | 1     |
| 80   | do                    |  |  |  |  | do               |  |  |  |  | ♂    | 368     | 73    | 168       | 57          | 1     |
|      | Philippines           |  |  |  |  | Unknown          |  |  |  |  | ♀    | 460     | 88    | (*)       | 62          | 1     |
|      | do                    |  |  |  |  | do               |  |  |  |  | ♂    | 355     | 72    | 156       | 61          | 1     |
|      | do                    |  |  |  |  | do               |  |  |  |  | ♀    | 432     | 80    | 164       | 60          | 1     |
|      | do                    |  |  |  |  | do               |  |  |  |  | ♂    | 362     | 81    | 159       | 61          | 1     |
|      | do                    |  |  |  |  | do               |  |  |  |  | ♀    | 340     | 63    | 151       | 55          | 1     |
|      | do                    |  |  |  |  | do               |  |  |  |  | ♀    | 422     | 77    | 158       | 57          | 1     |
| 608  | Port Banga, Zamboanga |  |  |  |  | W. J. Hutchinson |  |  |  |  | ♀    | 560     | 100   | 165       | 53          | 1     |
| 609  | do                    |  |  |  |  | do               |  |  |  |  | ♂    | 385     | 88    | 158       | 69          | 1     |
| 913  | Busuanga              |  |  |  |  | W. Schultze      |  |  |  |  | ♂    | 365     | 86    | 156       | 66          | 1     |
| 914  | do                    |  |  |  |  | do               |  |  |  |  | ♀    | 590     | 123   | 173       | 69          | 1     |
| 1563 | Bunawan, Agusan       |  |  |  |  | E. H. Taylor     |  |  |  |  | ♀    | 342     | 62    | 168       | 56          | 1     |
| 1624 | Polillo               |  |  |  |  | C. Canonizado    |  |  |  |  | ♀    | 390     | 81    | 158       | 61          | 1     |

| No.  | Preoculars. | Postoculars. | Loreals. | Upper labials. | Labials enter eye. | Lower labials. | Labials touch chin shields. | Chin shields, pairs. | Temporals. | Scale rows. | Collection.        |  |  |  |  |  |
|------|-------------|--------------|----------|----------------|--------------------|----------------|-----------------------------|----------------------|------------|-------------|--------------------|--|--|--|--|--|
| 79   | 2           | 2            | 1        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | E. H. Taylor.      |  |  |  |  |  |
| 80   | 2           | 3-2          | 2        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | Do.                |  |  |  |  |  |
|      | 2           | 2            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | Santo Tomás.       |  |  |  |  |  |
|      | 2           | 2            | 2        | 8              | 3, 4, 5            | 8              | 3                           | 3                    | 2+2        | 17          | Do.                |  |  |  |  |  |
|      | 2           | 2            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | Do.                |  |  |  |  |  |
|      | 2           | 3            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+3        | 17          | Do.                |  |  |  |  |  |
|      | 2           | 2            | 2        | 8              | 3, 4, 5            | 8              | 3                           | 3                    | 2+3        | 17          | Do.                |  |  |  |  |  |
|      | 2           | 2            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 2                    | 2+3        | 17          | Do.                |  |  |  |  |  |
| 608  | 2           | 2            | 1        | 8              | 3, 4, 5            | 7              | 3                           | 2                    | 2+2        | 17          | Bureau of Science. |  |  |  |  |  |
| 609  | 2           | 2            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 2                    | 2+2        | 17          | Do.                |  |  |  |  |  |
| 913  | 2-1         | 3            | 1        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | Do.                |  |  |  |  |  |
| 914  | 2           | 2            | 1        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+3        | 17          | Do.                |  |  |  |  |  |
| 1563 | 2           | 3-2          | 1-2      | 8              | 3, 4, 5            | 7              | 3                           | 2                    | 2+2        | 17          | Do.                |  |  |  |  |  |
| 1624 | 2           | 2            | 2        | 8              | 3, 4, 5            | 7              | 3                           | 3                    | 2+2        | 17          | Do.                |  |  |  |  |  |

\* Mutilated.

*Remarks.*—This snake probably occurs on all the Philippine islands; it is known from Luzon, Polillo, Palawan, Balabac, Mindanao, Bongao, Busuanga, Negros, and Dinagat. It is also

widely distributed over southeastern Asia, Malay Archipelago, and Formosa. The specimens are usually taken in forests, frequently under logs and trash, and quite as often while crawling about in the open, or on small bushes.

Genus **DRYOPHIOPS** Boulenger

*Chrysopelea*, part., GÜNTHER, Cat. Col. Snakes (1858) 88; Rept. Brit.

India (1864) 298; BOETTGER, Ber. Senck. Nat. Ges. (1886) 112;

CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 434.

*Dryophis*, part., JAN, Elenco Sist. Ofid. (1863) 88.

*Dryophiops* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 193; GRIF-FIN, Philip. Journ. Sci. § D 6 (1911) 264.

"Maxillary teeth 20, subequal, the last two or three a little enlarged and grooved; anterior mandibular teeth enlarged. Head elongate, distinct from neck, with distinct canthus rostralis; eye rather large, with 'horizontal pupil; nasal entire; frontal narrow, bell-shaped. Body slender, compressed; scales smooth, oblique, with apical pits, in 15 rows; ventrals with suture-like lateral keel and a notch on each side corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals." (*Boulenger.*)

Two species are known, *Dryophiops rubescens* Gray, and *D. philippina* Boulenger, only the latter occurring in the Philippines. This species is presumably confined to the northern part of the Philippines. It differs from the former species in the absence of a loreal scale.

**DRYOPHIOPS PHILIPPINA** Boulenger

PLATE 6, FIGS. 4 TO 6

*Chrysopelea rubescens* GÜNTHER, Cat. Col. Snakes (1858) 145; Rept.

Brit. India (1864) 299; STEINDACHNER, Reise d. Novara, Rept.

Wien (1869) 71; BOETTGER, Ber. Senck. Nat. Ges. (1886) 112;

CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 434.

*Dryophiops philippina* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 193, pl. 9, fig. 2; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 264.

*Description of species.*—(From No. 132, E. H. Taylor collection; collected at Lamao Experiment Station, Bataan, Luzon, June 20, 1915, by Homer C. McNamara.) Rostral low, at least twice as wide as high, visible from above only as a line, largest suture with internasal, smallest with first labial; internasals narrowed in front, shorter than nasals; prefrontals wide, deep, large, in contact with second and third labials, about twice as large as internasals; frontal as long as its distance from end of snout, slightly wider than supraoculars, laterally concave, somewhat bell-shaped, narrowly separated from preocular; parietals

large, three-fourths as wide as long, bordered laterally by 4 temporals, in contact with superior postocular; nasal single, wedge-shaped, nostril pierced near central upper part; loreal wanting; preocular rather large, touching 2 labials; supraocular as long as and but slightly narrower than frontal, in contact with prefrontal at a single point; 2 postoculars, superior largest; temporals  $2 + 2 + 2 + 2$ , gradually increasing in size; first scale row behind temporals and parietals somewhat enlarged; 9 upper labials, fourth, fifth, and sixth entering eye; 9 lower labials, 4 in contact with anterior pair of chin shields; these are not more than half the length of second pair; ventrals 186; anal divided; subcaudals 135; scales in 15 smooth rows, somewhat rectangular in shape, apical pits wanting; ventrals and subcaudals with keel and notch, the ends rather angular; diameter of eye much less than distance from nostril, pupil horizontal.

*Color in life.*—Above dull brownish gray, with many of the scales on first fourth of body edged or spotted irregularly with black, the rest of body with scattered dorsal spots, the scales minutely powdered with small various-sized dots; below creamy white, with a powdering of small and minute dots; throat and chin immaculate; head thickly spotted with rather large brownish spots; prefrontals each with a short line; internasals with diagonal lines; an irregularly edged line of lavender edged with dark brown goes from point of snout through eye to neck, and widens a little at angle of jaw; a dull stripe from occipital region to neck.

*Measurements of Dryophiops philippina Boulenger.*

|                | mm. |
|----------------|-----|
| Total length   | 558 |
| Snout to vent  | 373 |
| Tail           | 185 |
| Length of head | 18  |
| Width of head  | 10  |

*Variation.*—The three specimens listed from the Bureau of Science collection are grayish lavender in color. No. 1486 shows much less spotting on the dorsal and the ventral surfaces than does the specimen described. The known ventral range is from 177 to 186; the subcaudal, from 111 to 135. Boulenger lists a specimen 750 millimeters long.

*Remarks.*—This species is known from Luzon, Mindoro, and Sibuyan. I failed to find it in Mindanao. A single specimen was observed in Bataan near the foot of Mount Mariveles, but

it escaped without being captured. Three specimens are listed in Boulenger's Catalogue; one is from northern Luzon, and the other two are specimens collected by H. Cuming, labeled "Philippines."

The species is arboreal and feeds on small lizards for the most part. The grooved fangs suggest the presence of poison glands. The poison is incapable of serious injury to larger animals or man.

TABLE 44.—Measurements and scale counts of *Dryophiops philippina* Boulenger.

| No.  | Locality.      | Collector.                   | Sex. | Length. | Tail. | Ventrals. |
|------|----------------|------------------------------|------|---------|-------|-----------|
|      |                |                              |      | mm.     | mm.   |           |
| 132  | Lamiao, Bataan | H. C. McNamara               | ♂    | 558     | 185   | 186       |
| 207  | Manila         | Mrs. Graham                  | ♀    | 710     | 230   | 181       |
| 1486 | Mindoro        | Marine Biological Expedition | ♂    | 537     | 180   | 180       |
| 1487 | do             | do                           | ♂    | 627     | *160  | 179       |
| 695  | Sibuyan        | H. M. Weber                  | ♀    | 590     | 180   | 185       |

| No.  | Subcaudals. | Anal. | Preoculars. | Postoculars. | Upper labials. | Labials enter eye. | Temporals. | Scale rows. | Collection.        |
|------|-------------|-------|-------------|--------------|----------------|--------------------|------------|-------------|--------------------|
| 132  | 135         | 2     | 1           | 2            | 9              | 4, 5, 6            | 2+2+2      | 15          | E. H. Taylor.      |
| 207  | 123         | 2     | 1           | 2            | 9              | 4, 5, 6            | 2+2+2      | 15          | Bureau of Science. |
| 1486 | 134         | 2     | 1           | 2            | 9              | 4, 5, 6            | 2+2+2      | 15          | Do.                |
| 1487 | (a)         | 2     | 1           | 2            | 9              | 4, 5, 6            | 2+2+2      | 15          | Do.                |
| 695  | 111         | 2     | 1           | 2            | 9              | 4, 5, 6            | 2+2+2      | 15          | E. H. Taylor.      |

\* Mutilated.

### Genus CHRYSOPELEA Boie

*Chrysopelea* BOIE, Isis (1827) 520; WAGLER, Syst. Amph. (1830) 188; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 195.

"Maxillary teeth 20 to 22, subequal, the last three a little longer and grooved; anterior mandibular teeth longest. Head distinct from neck; eye rather large, with round pupil. Body elongate, compressed; scales smooth or feebly keeled, oblique, with apical pits, in 17 rows; ventrals with suture-like lateral keel and a notch on each side corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals." (Boulenger.)

Only a single species, *Chrysopelea ornata* (Shaw), enters the Philippines. It is a widely distributed form and varies much in coloration. The loreal is a variable element.

## CHRYSOPELEA ORNATA (Shaw)

PLATE 11, FIGS. 6 TO 8

*Coluber ornatus* SHAW, Zool. 3 (1802) 477.*Tyria ornata* FITZINGER, Neue Class. Rept. (1837) 60.*Chrysopelea ornata* BOIE, Isis (1827) 546; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1042; JAN, Icon. Gén. (1869) 33, pl. 1, fig. 1; BOETTER, Ber. Offenb. Ver. Nat. (1888) 84; BOULENGER, Fauna Brit. India, Rept. (1890) 371; Cat. Snakes Brit. Mus. 3 (1896) 196.*Crysopelea ornata* TAYLOR, Philip. Journ. Sci. § D 12 (1917) 366; § D 13 (1918) 261, typ. err.

*Description of species.*—(From No. 428, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, 1912, by E. H. Taylor.) Snout distinctly flattened; rostral but little broader than deep, broadly visible from above, its broadest suture formed with nasals; internasals more than half as large as prefrontals and nearly as long; prefrontals forming subequal sutures with frontal, preocular, and internasal; frontal broadest at its extreme anterior portion, longer than wide, but little wider than supraocular and about as long, equal to its distance from end of snout; parietals very broad, nearly as broad as long, longer than frontal, touching only superior postocular; 2 nasals, subequal in size; nostril rather large; loreal about twice as long as high; preocular large, visible from above, touching frontal; supraoculars very broad; 2 postoculars, superior largest; temporals 2 + 2 + 2; 9 upper labials, fourth, fifth, and sixth entering eye; 11 lower labials, first 5 touching first chin shields which are shorter and broader than posterior; mental triangular; scales smooth, with apical pits, in 17 rows, no evidence of keels present; ventrals 214, each with a strong keel and notch, the outer parts rounding and turned up on side, the last ventral divided; subcaudals 119, keeled and notched (extreme tip of tail injured). Head distinct from neck; eye large, pupil round.

*Measurements of Chrysopelea ornata (Shaw).*

|                | mm. |
|----------------|-----|
| Total length   | 962 |
| Snout to vent  | 707 |
| Tail           | 255 |
| Length of head | 25  |
| Width of head  | 13  |

*Color in life.*—Black above with a large yellowish green spot on each scale; spots larger on sides; red spots on middle line of back arranged like a four-petaled flower; a yellow band crosses behind parietals, and another in front of parietals; a third line crosses head in front of frontal; various black and yellow

irregular lines crossing head; temporals each with a greenish yellow spot; upper labials yellow, their upper edges black; chin and throat immaculate greenish yellow.

*Variation.*—The specimens studied have a ventral range of from 208 to 218, and a subcaudal range from 128 to 142. The preocular frequently fails to touch the frontal. There are seven specimens in my collection from central eastern Mindoro, five of which have the loreal scale wanting, and the head abnormally flat. The specimens examined from northern Mindoro do not exhibit these characters. Two specimens from Balabac also have the loreal wanting, but they differ greatly in color and markings from Mindoro specimens. Boulenger mentions that the loreal is sometimes fused with the prefrontal.

TABLE 45.—*Measurements and scale counts of Chrysopelea ornata (Shaw).*

| No.  | Sex. | Locality.             | Collector.           | Total length. | Tail length.     | Ventrals. |
|------|------|-----------------------|----------------------|---------------|------------------|-----------|
|      |      |                       |                      | mm.           | mm.              |           |
| 402  | ♂    | Camiguin.....         | R. C. McGregor ..... | 975           | 284              | 209       |
| 234  | ♂    | Polillo .....         | C. Canonizado .....  | 760           | 242              | 208       |
| 241  | ♀    | .....do .....         | .....do .....        | 1055          | 315              | 217       |
| 247  | ♀    | .....do .....         | .....do .....        | 805           | 237              | 214       |
| 249  | ♀    | .....do .....         | .....do .....        | 910           | 280              | 208       |
| 368  | ♀    | Bunawan, Agusan ..... | E. H. Taylor .....   | 765           | 230              | 218       |
| 428  | ♀    | .....do .....         | .....do .....        | 962           | <sup>a</sup> 255 | 214       |
| 595  | ♀    | .....do .....         | .....do .....        | 900           | 248              | 218       |
| 1832 | ♀    | Bubuan Island .....   | .....do .....        | 970           | <sup>a</sup> 140 | 208       |

| No.  | Subcaudals. | Upper labials. | Lower labials. | Pre-ocular touches frontal. | Post-oculars. | Loreal.       | Temporals. | Collection.        |
|------|-------------|----------------|----------------|-----------------------------|---------------|---------------|------------|--------------------|
| 402  | 134         | 9              | 10             | Yes                         | 3             | Present.....  | 2+2+2      | Bureau of Science. |
| 234  | 138         | 9              | 9              | Yes                         | 2             | .....do ..... | 2+2+2      | Do.                |
| 241  | 142         | 9              | 10             | No                          | 2             | .....do ..... | 2+2+2      | Do.                |
| 247  | 134         | 9              | 10             | No                          | 2             | .....do ..... | 2+2+2      | Do.                |
| 249  | 130         | 9              | 10             | Yes                         | 2             | .....do ..... | 2+2+2      | Do.                |
| 368  | 138         | 10             | 11             | Yes                         | 2             | .....do ..... | 2+2+2      | E. H. Taylor.      |
| 428  | (*)         | 9              | 11             | Yes                         | 2             | .....do ..... | 2+2+2      | Do.                |
| 595  | 128         | 9              | 11             | Yes                         | 2             | .....do ..... | 2+2+2      | Do.                |
| 1832 | (*)         | 9              | 8              | No                          | 2             | .....do ..... | 1+2+2      | Bureau of Science. |

<sup>a</sup> Tail mutilated.

The specimens vary considerably in color, but this is largely due to age. The young are dark brown to blackish traversed by very numerous greenish or reddish yellow bars; specimens somewhat older have greenish spots on the black scales between the light bars; medium-sized specimens usually exhibit the series of red spots on the black line as in the described specimen.

Some older specimens become almost a uniform brown, with a few black marks dorsally. Specimens preserved in formalin become a deep blue-black in color. I believe that large series from various islands will probably show constant variations of sorts.

*Remarks.*—This species is widely distributed in the Philippines. It is known from Luzon (several localities), Polillo, Camiguin, Mindoro, Banton, Bantayan, Mindanao, Samar, Palawan, and Bubuan.

It is widely distributed throughout the Malay Peninsula and Archipelago. The species is probably slightly poisonous, but is not dangerous to man.

#### Genus DRYOPHIS Dalman

*Dryinus*, part., MERREM, Tent. Syst. Amph. (1820) 136; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 808.

*Dryophis* DALMAN, Oefvers. of Zool. Arb., Stockholm (1822); FITZINGER, Neue Class. Rept. (1826) 29; BOULENGER, Fauna Brit. India, Rept. (1890) 367; Cat. Snakes Brit. Mus. 3 (1896) 177.

*Tragops* GÜNTHER, Rept. Brit. India (1864) 305.

*Passerita* GRAY, Ann. Phil. 10 (1825) 208; GÜNTHER, Cat. Col. Snakes (1858) 160.

*Psammophis*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 887.

*Tropidococcyx* GÜNTHER, Ann. & Mag. Nat. Hist. III 6 (1860) 428.

"Maxillary teeth 12 to 15, one or two in the middle much enlarged, fang-like, and followed by an interspace, after which the teeth are very small; one or two posterior grooved fangs, situated below the posterior border of the eye; mandibular teeth increasing in length to the third or fourth, which is very large, fang-like; the posterior small. Head elongate, distinct from neck, with strong canthus rostralis and concave lores; eye rather large, with horizontal pupil; nostril in the posterior part of a single nasal; frontal narrow, more or less bell-shaped. Body much elongate and compressed; scales smooth, without apical pits, in 15 rows, disposed obliquely, vertebral row slightly enlarged; ventrals rounded. Tail long; subcaudals in two rows." (*Boulenger.*)

#### Key to the Philippine species of *Dryophis* Dalman.

a<sup>1</sup>. Anal divided; 1 preocular; 3 labials entering eye; 3 small loreals; internasal in contact with labial..... *D. prasinus* Boie (p. 219).

a<sup>2</sup>. Anal single; 2 preoculars; internasals not in contact with labial; 2 labials enter eye.

b<sup>1</sup>. Loreals small; color green, blue-green, or reddish.

*D. preocularis* sp. nov. (p. 222).

b<sup>2</sup>. A large loreal below 2 small ones; color gray.

*D. griseus* sp. nov. (p. 221).

DRYOPHIS PRASINUS Boie

*Dryinus nasutus* BELL, Zool. Journ. 2 (1825) 327.

*Dryophis prasinus* BOIE, Isis (1827) 545; SCHLEGEL, Abbild. (1837) pl. 8, figs. 1-6; GÜNTHER, Cat. Col. Snakes (1858) 159; JAN, Icon. Gén. (1869) 33, pl. 5, fig. 1; BOULENGER, Fauna Brit. India, Rept. (1890) 369; Cat. Snakes Brit. Mus. 3 (1896) 181; PETERS, Mon. Berl. Ak. (1861) 688; FISCHER, Jahrb. wiss. Anst. Hamburg (1885) 80.

*Dryinus prasinus*, part., CANTOR, Cat. Mal. Rept. (1847) 81.

*Oxybelis fulgidus*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 817.

*Tragops prasinus* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 824; GÜNTHER, Rept. Brit. India (1864) 303; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 434 (and var.).

*Tragops xanthozonius* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 824; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 435.

*Description of species.*—(From No. 257, Bureau of Science collection; collected at Iwahig, Palawan, December 22, 1907, by C. M. Weber.) Head narrow, elongate; snout projecting; rostral small, barely visible above; anterior edge of nasals also visible above; internasals much longer than wide, in contact (on one side only) with second labial; prefrontal about twice as long as wide, posterior edges rounding, overlapping frontal; frontal elongate, much narrowed posteriorly, shorter than its distance to end of nose; supraoculars very large, nearly as wide as long, wider than frontal; parietals long, somewhat longer than frontal; nasal three times as long as wide; 3 and 4 very small loreals; 1 large, irregular preocular; 2 postoculars, upper larger; temporals 2 + 3 + 3, third upper largest; 9 upper labials, fourth, fifth, and sixth entering eye, seventh largest, ninth much elongate; mental small, as wide as rostral; 8 and 9 lower labials, first 4 in contact with first pair of chin shields which are very much shorter than second pair; latter bordered by 2 labials; eye large, pupil horizontal; a deep elongate depression from eye to nostril; scales in 15 rows, the median somewhat enlarged toward posterior part of body; scales on back above anal region keeled; ventrals, 211, each with indistinct keels laterally; subcaudals, 177; anal divided.

*Measurements of Dryophis prasinus Boie.*

|                | mm.   |
|----------------|-------|
| Total length   | 1,400 |
| Snout to vent  | 888   |
| Tail           | 512   |
| Length of head | 37    |
| Width of head  | 14    |

*Color in alcohol.*—Above greenish lavender, more greenish anteriorly; skin between scales lavender with the skin whitish between alternating transverse rows; belly grayish or greenish, with two distinct cream stripes running entire length of body on outer side of ventrals.

*Remarks.*—This is the typical *Dryophis prasinus* and agrees well with Boulenger's description of the species in having 1 preocular, 3 labials entering eye, and the divided anal; the variation in ventral counts as shown in the table is 209 to 222; of subcaudals 174 to 202, all of which counts fall well within Boulenger's limits.

TABLE 46.—Measurements and scale counts of *Dryophis prasinus* Boie.

| No. | Sex. | Locality.    | Collector.       | Length. | Tail. | Ventrals. | Subcaudals. | Anal. | Loreals. |
|-----|------|--------------|------------------|---------|-------|-----------|-------------|-------|----------|
|     |      |              |                  | mm.     | mm.   |           |             |       |          |
| 253 | ♂    | Palawan..... | C. M. Weber..... | 1,160   | 450   | 211       | 192         | 2     | 3        |
| 255 | ♀    | do.....      | do.....          | 1,340   |       | 218       | 202         | 2     | 2        |
| 256 | ♂    | do.....      | do.....          | 1,440   | 510   | 219       | 189         | 2     | 3        |
| 257 | ♀    | do.....      | do.....          | 1,400   | 512   | 211       | 177         | 2     | 3-4      |
| 258 | ♂    | do.....      | do.....          | 1,370   |       | 221       | 198         | 2     | 3        |
| 263 | ♂    | do.....      | do.....          | 1,410   | 500   | 222       | 177         | 2     | 3        |
| 267 | ♀    | do.....      | do.....          | 970     |       | 219       | 191         | 2     | 3        |
| 268 | ♂    | do.....      | do.....          | 953     | 340   | 209       | 192         | 2     | 3        |
| 272 | ♂    | do.....      | C. H. Lamb.....  |         |       |           |             | 2     | 3        |
| 273 | ♂    | do.....      | W. Schultze..... | 870     | 300   | 215       | 191         | 2     | 4        |
| 275 | ♂    | do.....      | C. M. Weber..... |         |       |           |             | 2     | 3        |
| 345 | ♀    | do.....      | do.....          | 1,315   | 485   | 213       | 174         | 2     | 2        |

| No. | Preoculars. | Postoculars. | Upper labials. | Lower labials. | Labials enter eye.        | Temporals. | Scale rows. | Labial touches internasal. | Collection.        |
|-----|-------------|--------------|----------------|----------------|---------------------------|------------|-------------|----------------------------|--------------------|
| 253 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Bureau of Science. |
| 255 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 256 | 1           | 2            | 9-10           | 9              | { 4, 5, 6<br>4, 5, 6, 7 } | 2+2+3      | 15          | Yes                        | Do.                |
| 257 | 1           | 2            | 9              | 8-9            | 4, 5, 6                   | 2+2+3      | 15          | Yes                        | Do.                |
| 258 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 263 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+2+3      | 15          | Yes                        | Do.                |
| 267 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 268 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+4      | 15          | Yes                        | Do.                |
| 272 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 273 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 275 | 1           | 2            | 9              | 9              | 4, 5, 6                   | 2+3+3      | 15          | Yes                        | Do.                |
| 345 | 1           | 2            | 8              | 9              | 4, 5, 6                   | 2+2+4      | 15          | Yes                        | Do.                |

This species in the Philippines is probably confined to Palawan and the near-by islands; outside the Philippines it is known in southern Asia and the Malay Archipelago.

DRYOPHIS GRISEUS sp. nov.

*Type*.—No. 271, Bureau of Science collection; collected on Camiguin Island, Cagayan Islands, in 1907, by R. C. McGregor.

*Description of type*.—(Adult male.) Head long, slender, snout projecting; rostral visible above, the projecting part somewhat striate; internasals long, narrow, not touching labials; prefrontals nearly twice as long as wide; frontal elongate, shorter than its distance to end of snout; parietals a little longer than broad; nasal elongate, four times as long as wide; 2 moderate-sized loreals above a very large loreal; 2 large preoculars, upper touching frontal; 2 postoculars; an anterior and a posterior subocular; temporals 2 + 3 + 3, third upper largest; 8 and 9 upper labials, third and fourth upper labials broken, normally, leaving the lower postocular and a large square loreal scale below the 2 upper loreals; fifth labial enters eye; 9 and 8 lower labials, fourth and fifth touching anterior pair of chin shields, which are smaller than second pair; ventrals, 208; subcaudals, 160 (tip of tail missing; estimated 15 subcaudals also missing); anal single, body compressed with only very indistinct lateral keels on ventrals.

*Color in alcohol*.—Above uniform gray, growing lighter gray on sides; skin on neck and body between scales black and white, the black extending on scales on anterior part of body; tail above gray, at base mottled with darker, growing brownish toward end; belly gray-white with a cream-white stripe along sides of belly; tail dark mottled below.

*Measurements of Dryophis griseus sp. nov.*

|                | mm.   |
|----------------|-------|
| Total length   | 1,498 |
| Snout to vent  | 951   |
| Tail           | 547   |
| Length of head | 36    |
| Width of head  | 16    |

*Variation*.—Two other specimens are in my collection; one from Limay, Bataan, the other from Montalban, near Manila. The Limay specimen agrees with the type in practically all details save that the fourth labial enters the eye, and the tail is not so dark as in the type.

*Remarks.*—This species may be identical with Cope's variety *laeta*. Unfortunately his description is not at hand. If the species are identical, then Cope's name will be used as a specific, and not as a varietal name.

Known from Luzon and Camiguin Island. There is a specimen of this species in the collection of the Ateneo de Manila. This species differs from *Dryophis prasinus* in having an undivided anal, and in having 2 preoculars instead of 1.

From *Dryophis preocularis* it differs in the presence of a large loreal in front of the lower preocular. From both it differs in the distinctive coloration. It is probably most closely related to *D. fasciolatus* but differs in the number of loreals and preoculars.

TABLE 47.—Measurements and scale counts of *Dryophis griseus* sp. nov.

| No.   | Sex. | Locality.          |  | Collector.          |  | Length. | Tail. | Ventrals. |
|-------|------|--------------------|--|---------------------|--|---------|-------|-----------|
|       |      |                    |  |                     |  | mm.     | mm.   |           |
| 254   | ♂    | Limay, Bataan..... |  | H. M. Curran.....   |  | 985     | 351   | 219       |
| 271   | ♂    | Camiguin.....      |  | R. C. McGregor..... |  | 1,498   | 547   | 208       |
| R 663 | ♂    | Montalban.....     |  | W. Schultze.....    |  | (a)     | 545   | (a)       |

| No.   | Subcaudals. | Anal. | Loreals.          | Preoculars. | Postoculars. | Labials. |       | Temporals. | Scale rows. | Collection.        |
|-------|-------------|-------|-------------------|-------------|--------------|----------|-------|------------|-------------|--------------------|
|       |             |       |                   |             |              | Upper    | Lower |            |             |                    |
| 254   | 180         | 1     | { $\frac{2}{1}$ } | 2           | 2            | 8        | 9     | 2+3+3      | 15          | Bureau of Science. |
| 271   | 160         | 1     | { $\frac{2}{1}$ } | 2           | 2            | 8-9      | 9-8   | 2+3+3      | 15          | Do.                |
| R 663 | 176         | 1     | { $\frac{2}{1}$ } | 3           | 2            | 9        | 10-9  | 2+3+3      | 15          | E. H. Taylor.      |

<sup>a</sup> Mutilated.

**DRYOPHIS PREOCULARIS** sp. nov.

PLATE 28

*Type.*—No. 408, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, March 12, 1913, by E. H. Taylor.

*Description of species.*—(Adult female.) Rostral broader than high, the portion seen above a mere line; internasals elongate, nearly twice as long as wide, their outer edge bent sharply down at canthus rostralis; prefrontals somewhat wider than internasals, twice as long as wide, overlapping frontal;

frontal at least one and a half times as long as wide; very narrow behind; in its widest part it does not equal width of supraoculars; parietals large, elongate; supraoculars large and projecting, so that eye is hardly visible from above; canthus rostralis very sharp; 2 large preoculars, the upper separating supraoculars from prefrontals; 2 loreals, the posterior largest; nostril in a very elongate, very narrow nasal; 2 small postoculars; temporals 2 + 3; parietals bordered by 3 temporals; 9 upper labials in the following order of size: sixth, fifth, eighth, second, first, third, seventh, fourth, ninth; fourth, fifth, and sixth enter eye; mental very small, triangular; 7 lower labials in the following order of size: fifth, fourth, sixth, seventh, first, third, second; 4 labials touch first pair of chin shields; scales smooth, in 15 rows; ventrals, 227; keeled laterally; subcaudals, 110; anal undivided; eye large, equal to half its distance from snout; latter acuminate, projecting.

*Color in life*.—Bluish green tending toward yellowish green on sides, with no markings of any sort; head greenish; belly greenish with a narrow cream line running full length of body and tail on outer part of ventrals and anals.

*Remarks*.—This species is widely distributed, from Mindanao to Luzon. In the character of the anal shield and in the arrangement of the preoculars it is constant. In Negros and Panay there occurs what appears to be a variety of the species. It is red and doubtless represents what has been regarded by other authors as *Dryophis prasinus xanthozonus*. However, *Dryophis xanthozona* is a distinct species and is probably confined to southeastern Asia and Java. I regard the red form here as merely a color variety of *Dryophis preocularis*. A red form also occurs in *Dryophis prasinus*.

The species here described is known from Mindanao (green form); Negros (green and red forms), Panay (red form), Polillo (green form), and Luzon (green form). Additional material from Negros and Panay may warrant the separation of the red form as a subspecies.

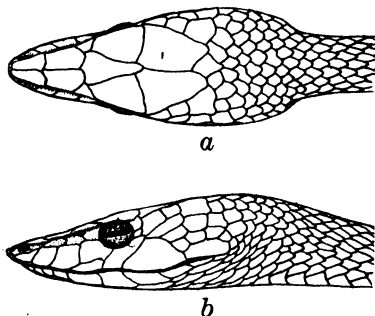


FIG. 19. *Dryophis preocularis* sp. nov.; drawing of a Polillo specimen; a, head, dorsal view; b, head, lateral view.

TABLE 48.—*Measurements and scale counts of Dryophis preocularis sp. nov.*

| No. | Sex. | Locality.      | Collector.         | Length. | Tail. | Ventrals. | Subcaudals. | Anal. |
|-----|------|----------------|--------------------|---------|-------|-----------|-------------|-------|
|     |      |                |                    | mm.     | mm.   |           |             |       |
| 269 | ♂    | Poilillo ..... | C. Canonizado..... | 1,020   | 382   | 221       | 199         | 1     |
| 274 | ♀    | do .....       | do .....           | 1,550   | 532   | 213       | 177         | 1     |
| 342 | ♀    | do .....       | do .....           | 1,145   | 460   | 216       | 192         | 1     |
| 343 | ♀    | do .....       | do .....           | 1,170   | 450   | 216       | 199         | 1     |
| 344 | ♂    | do .....       | do .....           | 450     | (a)   | 215       | (a)         | 1     |
| 346 | ♀    | do .....       | do .....           | 950     | 345   | 212       | 175         | 1     |
| 347 | ♂    | do .....       | do .....           | 840     | (a)   | 221       | (a)         | 1     |
| 349 | ♂    | do .....       | do .....           | 985     | 370   | 118       | 201         | 1     |
| 350 | ♀    | do .....       | do .....           | 1,460   | 500   | 219       | *169        | 1     |
| 351 | ♂    | do .....       | do .....           | 1,080   | 400   | 214       | 183         | 1     |
| 352 | ♂    | do .....       | do .....           |         |       | 216       | 181         | 1     |

| No. | Lo-reals. | Preoculars. | Postoculars. | Upper labials. | Lower labials. | Labials enter eye. | Temporals. | Scale rows. | Collection.        |
|-----|-----------|-------------|--------------|----------------|----------------|--------------------|------------|-------------|--------------------|
| 269 | 2         | 2           | 2            | 8-10           | 9              | 5-6                | 2+3+3      | 15          | Bureau of Science. |
| 274 | 2         | 2           | 2            | 7              | 9              | 5                  | 2+3+3      | 15          | Do.                |
| 342 | 2-3       | 2           | 2            | 8              |                | 4-5                | 2+3+3      | 15          | Do.                |
| 343 | 3         | 2           | 2            | 8              | 9              | 4-5                | 2+2+3      | 15          | Do.                |
| 344 | 2         | 2           | 2            | 8              | 9              | 4-5                | 2+3+3      | 15          | Do.                |
| 346 | 3         | 2           | 2            | 8              | 9              | 4-5                | 2+3+3      | 15          | Do.                |
| 347 | 2         | 2           | 2            | 8-9            | 9              | 4-5                | 2+3+3      | 15          | Do.                |
| 349 | 3         | 2           | 2            | 8              | 9              | 4-5                | 2+3+3      | 15          | Do.                |
| 350 | 2         | 1           | 2            | 8-9            | 9              | 4-5-6              | 2+3+3      | 15          | Do.                |
| 351 | 2         | 2           | 2            | 8-9            | 8              | 4-5                | 2+3+3      | 15          | Do.                |
| 352 | 3         | 2           | 2            | 8              | 9              | 4-5                | 2+3+3      | 15          | Do.                |

a Tip of tail missing.

## DEADLY POISONOUS SNAKES

## ELAPIDÆ

An erect, grooved or perforated fang on the anterior portion of the anterior maxillary bone, or several anterior maxillary teeth grooved or perforated; in either case connecting with a poison gland; otherwise, as the Natricidæ. Deadly poisonous.

The family corresponds to Boulenger's group C, of the family Colubridæ, which he calls Proteroglypha. The family Elapidæ is composed of two subfamilies; the first group consists of aquatic or semiaquatic snakes; the second, of land snakes.

*Key to the subfamilies of the Elapidæ.*

- α<sup>1</sup>. Tail compressed into a vertical fin..... Hydrinæ (p. 225).  
 α<sup>2</sup>. Tail cylindrical; poison fangs strongly developed..... Elapinæ (p. 254).

## HYDRINÆ

*Hydrophiinæ* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 264; WALL, Mem. As. Soc. Bengal 2 (1907-10) 169.

Nostrils dorsal or lateral, usually valvular; tail strongly compressed, oarlike; hypapophyses not developed throughout the vertebral column. Body compressed, the ventrals very small in marine types, or large in semiaquatic forms. Rostral shield with two notches in oral border; only the cleft part of tongue capable of being protruded. Anterior maxillary teeth folded into a tube or grooved; frequently posterior teeth also grooved. Deadly poisonous.

Eleven genera of this subfamily are recognized; with the exception of *Laticauda*, *Aipysurus*, and *Emydocephalus*, all are entirely aquatic. The three mentioned are found frequently at some distance from the water, and these genera are equipped with wide ventral scales, which enable them to perform land locomotion.

*Key to the Philippine genera of the Hydrinæ.*

a<sup>1</sup>. Ventral scales large, transversely widened.

b<sup>1</sup>. Nostrils on upper surface of snout; nasals in contact.

*Aipysurus* Lacépède (p. 225).

b<sup>2</sup>. Nostrils lateral; nasals separated by internasals.

*Laticauda* Laurenti (p. 227).

a<sup>2</sup>. Ventral scales small or indistinguishable from body scales; nostrils superior.

b<sup>1</sup>. All maxillary teeth grooved (sometimes faintly); 4 to 10 small teeth follow fangs..... *Disteira* Lacépède (p. 236).

b<sup>2</sup>. Only 2 to 5 faintly grooved teeth follow the large fangs.

*Lapemis* Gray (p. 249).

b<sup>3</sup>. Poison fangs short, followed after an interspace by 7 or 8 solid teeth..... *Pelamydrus* Stejneger (p. 252).

It is highly probable that species of other genera occur in the Islands, and that specimens will be taken along the coasts.

**Genus AIPYSURUS Lacépède**

*Aipysurus* LACÉPÈDE, Ann. Mus. 4 (1804) 197; DUMÉRIL and BIBRON Erp. Gén. 7 (1854) 1323; FISCHER, Abh. Natur. Hamburg 3 (1856) 31; JAN, Elenco Sist. Ofid. (1863) 108; GÜNTHER, Rept. Brit. India (1864) 357; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 303; WALL, Mem. As. Soc. Bengal 2 (1907-10) 189.

*Stephanophydra* TSCHUDI, Arch. Nat. (1837) 331; GRAY, Cat. Snakes (1849) 59.

*Hydrophis*, part., SCHLEGEL, Phys. Serp. 2 (1837) 488.

*Hypotropis* GRAY, Ann. & Mag. Nat. Hist. 18 (1846) 284.

*Tomogaster*, part., SCHMIDT, Abh. Natur. Hamburg 2 (1852) 75.

*Emydocephalus* KREFFT, Proc. Zool. Soc. London (1869) 321.

*Pelagophis* PETERS and DORIA, Ann. Mus. Genova 13 (1878) 413.

"Maxillary a little longer than the ectopterygoid, extending forwards beyond the palatine; poison-fangs moderate, followed, after a short interspace, by 8 to 10 grooved teeth; anterior mandibular teeth feebly grooved. Snout short; nostrils superior; head-shields large or broken up into scales; nasals in contact with each other. Body moderate; scales imbricate; ventrals large, keeled in the middle." (*Boulenger.*)

The genus is distributed in the Tropics, throughout the Malay Archipelago and the western Pacific Ocean. Boulenger recognizes four species, one of which, *Aipysurus annulatus* Krefft, Wall has placed in the genus *Emydocephalus*. Only one species has been recorded from the Philippines.

#### AIPYSURUS EYDOUXII (Gray)

*Tomogaster eydouxi* GRAY, Cat. Vip. Snakes (1849) 59.

*Thalassophis anguillæformis* SCHMIDT, Abh. Natur. Hamburg 2 (1852) 76, pl. 1.

*Thalassophis muraenæformis* SCHMIDT, Abh. Natur. Hamburg 2 (1852) 77.

*Aipysurus lævis* (non Lacépède) GUICHENOT, Voy. Pôle Sud. Zool. 3, Rept. (1853) 21, pl. 6; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1326, pl. 77b, fig. 4; FISCHER, Abh. Natur. Hamburg. 3 (1856) 32; JAN, Icon. Gén. (1872) 40, pl. 2, fig. 1.

*Aipysurus margaritophorus* BLEEKER, Nat. Tijds. Nederl. Ind. 16 (1858) 49.

*Aipysurus anguillæformis* GÜNTHER, Rept. Brit. India (1864) 357; BOETTGER, Zool. Anz. (1892) 420.

*Aipysurus eydouxi* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 304; WALL, Mem. As. Soc. Bengal 2 (1907-10) 189, figs. 5, A, B, C (after Jan).

*Description of species.*—(From Boulenger.) "Eye a little longer than its distance from the mouth. Rostral a little broader than deep; upper head-shields regular; frontal large, once and

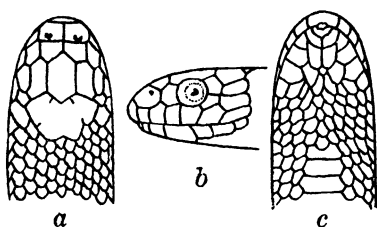


FIG. 20. *Aipysurus eydouxi* (Gray); after Jan, copied from Wall; a, head, dorsal view; b, head, lateral view; c, head ventral view.

two thirds to twice as long as broad, longer than its distance from the end of the snout, as long as or a little longer than the parietals; nasal in contact with or narrowly separated from the præocular; one præ- and two postoculars; temporals 1 + 2 + or 2 + 2; six upper labials, fourth entering the eye; anterior chin-shields shorter

than the posterior, which are separated by an azygous shield. Scales smooth, in 17 rows. Ventrals, 140-142.

*Color*.—"Dark brown above, with cross-bands of yellow, black-edged scales, often broken up on the vertebral line; these bands widening towards the belly, which is yellow, with or without dark brown spots."

*Measurements of Aipysurus eydouxi (Gray).*

|               | mm. |
|---------------|-----|
| Total length  | 490 |
| Snout to vent | 420 |
| Tail          | 70  |

*Variation*.—Wall adds the following characters: Rostral touches 4 shields, the portion visible above about half the internasal suture. Prefrontals not in contact with supralabials, usually undivided, but sometimes divided longitudinally on one or both sides into two parts; the sutures of frontal subequal, one-third or one-fourth longer than supraoculars, longer than parietals; parietals undivided or divided; nasals touch 2 supralabials; fourth lower labial largest; 2 pairs of chin shields, the second pair separated by a single scale; ventrals from 138 to 142, three or more times the width of outer scale row.

*Remarks*.—This species is rare in the Philippines. I have seen no specimen. Both Boulenger and Wall give the Philippines as part of its range, and the species is included in the present work on their authority.

**Genus LATICAUDA Laurenti**

*Laticauda* LAURENTI, Syn. Rept. (1768) 109; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 402.

*Hydrus*, part., SCHNEIDER, Hist. Amph. 1 (1799) 233.

*Platurus* LATREILLE, Hist. Nat. Rept. 4 (1802) 183; DAUDIN, Rept. 7 (1803) 223; WAGLER, Syst. Amph. (1830) 166; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1318; FISCHER, Abh. Natur. Hamburg 3 (1856) 27; JAN, Elenco Sist. Ofid. (1863) 108; GÜNTHER, Rept. Brit. India (1864) 355; BOETTGER, Ber. Senck. Nat. Ges. (1886) 118; BOULENGER, Fauna Brit. India, Rept. (1890) 394; Cat. Snakes Brit. Mus. 3 (1896) 306; CASTO DE ELERA, Cat. Fauna Filipinas † (1895) 442.

*Hydrophis*, part., SCHLEGEL, Phys. Serp. 2 (1837) 488.

"Maxillary much shorter than the ectopterygoid, extending forwards beyond the palatine, with two large poison-fangs; one or two small solid teeth near the posterior extremity of the maxillary. Head-shields large; nostrils lateral, the nasals separated by internasals; præocular present; no loreal. Body much elongate; scales smooth and imbricate; ventrals and subcaudals large." (*Boulenger*.)

Stejneger \* recognizes provisionally five species of the genus, while Wall † recognizes but three. Three species are found in the Philippines.

*Key to the Philippine species of Laticauda Laurenti.*

- a<sup>1</sup>. Rostral not divided horizontally; belly without median keel.
  - b<sup>1</sup>. Two prefrontals; scales in 19 rows.. *L. laticaudata* (Linnæus) (p. 228).
  - b<sup>2</sup>. Three prefrontals; scales in 21 to 25 rows.
    - L. colubrina* (Schneider) (p. 231).
- a<sup>2</sup>. Rostral divided horizontally; belly with median keel on posterior half.
  - L. semifasciata* (Reinwardt) (p. 234).

I disagree with Barbour's ‡ opinion that the first two should be regarded as subspecies of a single species. Besides the almost constant variation of certain scale elements, the fact should not be overlooked that *L. colubrina* apparently grows to nearly double the size of *L. laticaudata*.

**LATICAUDA LATICAUDATA (Linnæus)**

- Coluber laticaudatus* LINNÆUS, Mus. Ad. Frid. (1754) 31, pl. 16, fig. 1; Syst. Nat. ed. 10 1 (1758) 222; ed. 12 1 (1766) 383; ANDERSON, Bihang Svensk. Vet. Akad. Handl. IV 24 (1899) 18.
- Laticauda scutata* LAURENTI, Syn. Rept. (1768) 109.
- Platurus fasciatus* LATREILLE, Hist. Nat. Rept. 4 (1802) 185; FISCHER, Abh. Natur. Ver. Hamburg 3 (1856) 28; PETERS, Mon. Berl. Ak. (1861) 691; (1872) 860; HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia (1860) 493; BOULENGER, Proc. Zool. Soc. London (1887) 149.
- Hydrophis colubrinus*, part., SCHLEGEL, Phys. Serp. 2 (1837) 514.
- Platurus laticaudatus* GIRARD, Herp. U. S. Expl. Exp. (1858) 180; PETERS, Mon. Berl. Ak. (1877) 417; BOETTGER, Ber. Senck. Nat. Ges. (1886) 118; BOULENGER, Fauna Brit. India, Rept. (1890) 395, text fig; Cat. Snakes Brit. Mus. 3 (1896) 307; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 442; WALL, Proc. Zool. Soc. London (1903) 96 and 101; Mem. As. Soc. Bengal 2 (1907-10) 185.
- Platurus laurenti* RAFINESQUE, Am. Month. Mag. 1 (1817) 432.
- Coluber platycaudatus* OKEN, Allgem. Naturg. 8 (1836) 566.
- Platurus laticaudatus* var. A., GÜNTHER, Cat. Col. Snakes (1858) 272.
- Platurus fischeri* JAN, Rev. Mag. Zool. (1859) 149; Icon. Ophid. 40 (1872) pl. 1, fig. 2; GÜNTHER, Rept. Brit. India (1864) 356, pl. 25, fig. A; ANDERSON, Proc. Zool. Soc. London (1871) 189; FAYRER, Thanatoph. Ind. (1874) pl. 19.
- Platurus affinis* ANDERSON, Proc. Zool. Soc. London (1871) 190.

\* Loc. cit.

† Wall, Mem. As. Soc. Bengal 2 (1907-10) 107, states that the supposedly solid teeth really have very small grooves.

‡ Barbour, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 131.

*Laticauda laticaudata* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 402; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 265.

*Laticauda laticaudata laticaudata* BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 131.

*Description of species.*—(From No. 1834, E. H. Taylor collection, collected on Mindanao coast, October, 1913, by E. H. Taylor.) Head moderate, not or scarcely distinct from neck; rostral much higher than wide, scarcely visible above, forming its broadest suture with first labial; internasals triangular, narrowly in contact with rostral, forming their longest suture with nasal;

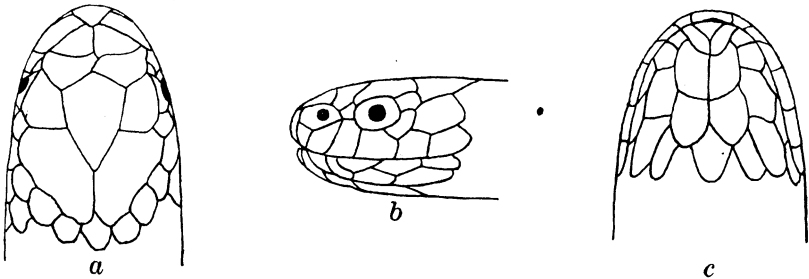


FIG. 21. *Laticauda laticaudata* (Linnaeus); after Wall; a, head, dorsal view; b, head, lateral view; c, chin.

prefrontals broader than deep, narrowly in contact laterally with third labial, separating nasal and prefrontal, the suture between prefrontals shorter than that between internasals; frontal longer than wide, four-sided, much longer than its distance from end of snout, as long as parietals; nasal narrow, elongate, nostril pierced nearer its posterior end, in contact with 3 labials; 1 preocular, higher than wide; 2 postoculars, the lower lying somewhat under posterior part of eye; 1 anterior temporal; temporal formula,  $1 + 2 + 3$ ; mental very small, not or very narrowly separated from second pair of labials, not touching chin shields; lower labials nearly hidden, for the most part lying horizontal on jaws, the 2 anterior touching first chin shields, which are a little smaller than posterior; tail strongly compressed, widened at tip.

*Color in life.*—Above blue with 66 black bars about body, of which 7 are confined to tail; bands are 3 scales wide on back, separated by interspaces of equal width but narrow on belly, a broad band on head, widest medially, not reaching anterior part of frontal; head band and 2 nuchal bands interrupted ventrally, but connected by a broad ventrolateral band on side of head and neck; no light labial band; top of snout yellow with

superciliary yellow line; a yellow band on chin and throat medially; belly yellow, the color reaching up halfway on sides; eye blue, small; pupil round.

*Measurements of Laticauda laticaudata (Linnæus).*

|                         | mm. |
|-------------------------|-----|
| Total length            | 581 |
| Snout to vent           | 515 |
| Tail                    | 66  |
| Length of head          | 15  |
| Width of head           | 8.5 |
| Depth of tail, greatest | 11  |

*Variation.*—In the three specimens examined the ventral range is 228 to 242; the subcaudal, 42 to 45; the number of bands varies between 53 and 66. The variation of scale counts in twelve specimens from various localities listed by Boulenger is as follows: Ventrals, 210 to 240 (average, 227); subcaudals, 25 to 45; bands, 29 to 48.

In this species, as in *Laticauda colubrina*, the subcaudals average about 10 more in males than in females. Philippine specimens have a higher average of ventrals, and a much higher average number of bands.

*Remarks.*—This species apparently does not attain as large a size as *Laticauda colubrina*. Specimens are usually found about rocky seacoasts. They feed largely on small eels.

TABLE 49.—*Measurements and scale counts of Laticauda laticaudata (Linnæus).*

| No.  | Locality. |       |  | Collector.                   |       |  | Sex or age. | Ventrals. | Subcaudals. | Anal.    |
|------|-----------|-------|--|------------------------------|-------|--|-------------|-----------|-------------|----------|
| 1834 | Mindanao  | ----- |  | E. H. Taylor                 | ----- |  | yg          | 234       | 43          | Pairs. 2 |
| 1419 | do        | ----- |  | do                           | ----- |  | yg          | 228       | 42          | 2        |
| 1286 | Mindoro   | ----- |  | Marine Biological Expedition | ----- |  | yg          | 242       | 45          | 2        |

| No.  | Labials. |            |                           | Preoculars. | Postoculars. | Temporals. | Bands. | Scale rows. | Length. | Tail.  | Collection.        |
|------|----------|------------|---------------------------|-------------|--------------|------------|--------|-------------|---------|--------|--------------------|
|      | Upper.   | Enter eye. | Touch first chin shields. |             |              |            |        |             |         |        |                    |
| 1834 | 7        | 3, 4       | 2                         | 1           | 2            | 1+2+3      | 66     | 19          | mm. 581 | mm. 66 | E. H. Taylor.      |
| 1419 | 7        | 3, 4       | 2                         | 1           | 2            | 1+2+3      | 56     | 19          | 460     | 57     | Do.                |
| 1286 | 7        | 3, 4       | 2                         | 1           | 2            | 1+2+3      | 53     | 19          | 593     | 72     | Bureau of Science. |

In the Philippines specimens are known from Mindanao, Sulu, Samar, and northern Mindoro. The species is widely distributed

outside the Philippines, being known from the Indian Ocean, the coasts of the islands of the East Indian Archipelago, and western and southern Pacific Ocean.

## LATICAUDA COLUBRINA (Schneider)

## PLATE 29

*Coluber laticaudatus*, part., LINNÆUS, Syst. Nat. ed. 10 1 (1776) 222; ed. 12 1 (1776) 383.

*Hydrus colubrinus* SCHNEIDER, Hist. Amph. 1 (1799) 238.

*Platurus fasciatus*, part., DAUDIN, Hist. Nat. Rept. 7 (1803) 226, pl. 85, fig. 1; DUMÉRIL and BIBRON, Erp. Gen. 7 (1854) 1321.

*Hydrophis colubrinus* SCHLEGEL, Phys. Serp. 2 (1837) 514, pl. 18, figs. 21 and 22; CUVIER, Reg. Anim., Rept. Atlas, pl. 36.

*Laticauda scutata* (Laurenti) CANTOR, Cat. Mal. Rept. (1847) 125.

*Platurus colubrinus* GIRARD, U. S. Expl. Exp. Herp. (1858) 178; PETERS, Mon. Berl. Ak. (1877) 418; FISCHER, Jahrb. wiss. Anst. Hamburg (1888) 18; BOULENGER, Fauna Brit. India, Rept. (1890) 395; Cat. Snakes Brit. Mus. 3 (1896) 308; WALL., Mem. As. Soc. Bengal 2 (1907-10) 186.

*Platurus scutatus* GÜNTHER, Rept. Brit. India (1864) 356.

*Platurus laticaudatus*, var. B., GÜNTHER Cat. Col. Snakes (1858) 272.

*Platurus fasciatus* var. *colubrina* FISCHER, Abh. Nat. Ver. Hamburg 3 (1856) 30.

*Platurus laticaudatus* var. *colubrina* BOETTGER, Ber. Senck. Nat. Ges. (1886) 118; Offenb. Ver. Naturk. 25 (1885) 155.

*Laticauda colubrina* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 406.

*Description of species.*—(From No. 908, Bureau of Science collection; collected on Dipolod Island, Sulu Archipelago, September, 1917, by E. H. Taylor.) Head large, somewhat distinct from neck, rather flattened above; rostral higher than wide, forming its broadest sutures with labials, its shortest with internasals, latter longer than wide, lying diagonally, in contact for about half their length, pointed anteriorly; prefrontals somewhat larger than internasals, separated from each other, touching nasal and preocular laterally; an azygous shield, lying between prefrontals and partially between internasals, forms a suture with frontal; latter almost twice as long as wide, produced to a long point behind; supraoculars about as wide as long; parietals wider than long, disposed diagonally, touching superior preocular; nasal single, elongate, nostril triangular, pierced in posterior part; 1 preocular touching second labial, widely separated from frontal; 2 postoculars, lower largest; 1 anterior temporal; temporal formula 1 + 2 + 3; 7 upper labials, third and fourth entering orbit; mental very small, first pair of lower labials barely in contact behind it, and followed by an azygous

postmental; lower labials small, usually not visible externally, only first 2 touching anterior pair of chin shields, which are smaller than second pair; 10 rows of scales between chin shields and first widened ventral; eye small, much less than its distance from nostril; scales in 23 to 25 rows around body, smooth, without apical pits; ventrals, 234; subcaudals, 35; anal divided, preceded by a second divided scale; tail strongly compressed, ending in a large scute.

*Color in life.*—Above, blue traversed by 42 black bands, about 4 scales wide, on back, and covering only 1 or 2 ventrals below, separated from each other by interspaces, 5 or 6 scales wide; tail with 4 bands, the last much widened. Head with a broad black spot; a broad black stripe on side; anterior part yellowish, with a yellow streak above eye to some distance on temporal region; a yellow stripe on lower part of upper labials and at angle of mouth; a broad black stripe from end of chin along each side of neck to third ventral, separated from its fellow by a broad median yellow stripe.

*Measurements of Laticauda colubrina (Schneider.)*

|                         | mm.   |
|-------------------------|-------|
| Total length            | 1,390 |
| Snout to vent           | 1,275 |
| Tail                    | 115   |
| Width of head           | 29    |
| Length of head          | 32    |
| Depth of tail, greatest | 31    |

*Variation.*—Males differ from females in having longer and thicker tails, not so strongly compressed at base, rather more triangular in cross section, and with an average of 9 more subcaudals; in medium-sized specimens, the ventrals have a double row of keels, nearly the same ventral average, with notches on anterior part of each scute. The range of ventral counts in the Philippine specimens examined is from 229 to 248; of the subcaudal from 34 to 47; the scale rows vary between 23 and 25, most of the specimens having 23 rows on anterior part of body and 25 beyond the middle of the widest part; in all specimens the ventral preceding anal is divided. The lower labials are bent over edge of mouth and lie for the most part horizontally; the mental is extremely small, the first pair of labials not or but barely touching a small azygous postmental. This scale is distinct in all save two specimens, in which it is fused with first labial. The number of black bands around body and tail varies between 43 and 59, the average being 49. In color most of the specimens are dark to grayish blue above barred

with black or brown, the width of the black bars half to three-fourths the width of the interspaces. Two Sulu specimens differ from the others examined in being greenish yellow with brown bands. It is significant that these two specimens have 59 bars across body. Boulenger gives the limit of scale variation as follows: Ventrals, 195 to 240, average, 217; subcaudals, 30 to 45; scale rows, 21 to 25; black bands, 28 to 54.

TABLE 50.—*Measurements and scale counts of Laticauda colubrina* (Schneider.)

| No.  | Locality.       |  |  | Collector.    | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Anals. |
|------|-----------------|--|--|---------------|------|---------|-------|-----------|-------------|--------|
|      |                 |  |  |               |      | mm.     | mm.   |           |             | Pairs. |
| 473  | Bantayan        |  |  | L. E. Griffin | ♀    | 1,470   | 120   | 236       | 34          | 2      |
| 474  | do              |  |  | do            | ♀    | 1,490   | 140   | 237       | 37          | 2      |
| 475  | Iwahig, Palawan |  |  | C. M. Weber   | ♂    | 940     | 130   | 237       | 45          | 2      |
| 476  | Bantayan        |  |  | L. E. Griffin | ♂    | 775     | 97    | 242       | 46          | 2      |
| 477  | Palawan         |  |  | C. Canonizado | ♂    | 390     | 54    | 229       | 45          | 2      |
| 478  | Bantayan        |  |  | L. E. Griffin | ♂    | 760     | 96    | 238       | 46          | 2      |
| 479  | do              |  |  | do            | ♂    | 455     | 57    | 236       | 44          | 2      |
| 480  | Palawan         |  |  | C. M. Weber   | ♂    | 945     | 135   | 240       | 47          | 2      |
| 908  | Dipolod         |  |  | E. H. Taylor  | ♀    | 1,390   | 115   | 234       | 35          | 2      |
| 1231 | Negros          |  |  | do            | ♀    | 995     | 100   | 246       | 36          | 2      |
| 1331 | do              |  |  | do            | ♀    | 963     | 110   | 239       | 36          | 2      |
| 1353 | do              |  |  | do            | ♂    | 720     | 90    | 235       | 44          | 2      |
| 1307 | do              |  |  | do            | ♂    | 875     | 105   | 235       | 44          | 2      |
| 1642 | do              |  |  | do            | ♀    | 1,430   | 140   | 238       | 36          | 3      |

| No.  | Labials. |            |                           | Azygous postmentals. | Prefrontals. | Preoculars. | Postoculars. | Temporals.   | Bands. | Collection.        |
|------|----------|------------|---------------------------|----------------------|--------------|-------------|--------------|--|--------|--------------------|
|      | Upper.   | Enter eye. | Touch first chin shields. |                      |              |             |              |  |        |                    |
| 473  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 54     | Bureau of Science. |
| 474  | 7-8      | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 49     | Do.                |
| 475  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 50     | Do.                |
| 476  | 7-8      | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 47     | Do.                |
| 477  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 43     | Do.                |
| 478  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 49     | Do.                |
| 479  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 48     | Do.                |
| 480  | 7        | 3, 4       | 2                         | (a)                  | 3            | 1           | 2            | 1+2+3  | 49     | Do.                |
| 908  | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 46     | Do.                |
| 1231 | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | $\left. \begin{matrix} 2+2+3 \\ 1+2+3 \end{matrix} \right\}$ | 59     | E. H. Taylor.      |
| 1331 | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 59     | Do.                |
| 1353 | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 50     | Do.                |
| 1307 | 7        | 3, 4       | 2                         | 1                    | 3            | 1           | 2            | 1+2+3  | 46     | Do.                |
| 1642 | 7        | 3, 4       | 2                         | (a)                  | 3            | 1           | 2            | 1+2+3  | 47     | Do.                |

\* Fused.

It will be seen, therefore, that Philippine specimens have an average of twenty ventrals more than the average of specimens listed by Boulenger. They differ also from other snakes of this species in the presence of the small azygous postmental and (in the males) of a double row of keels along the ventral scales with the scutes notched. I am convinced that Philippine forms represent a subspecies of *Laticauda colubrina*; whether it belongs with the typical form I am uncertain. The figure given in Cuvier \* is very probably of this group, since it agrees in the number of stripes and in the presence of a postmental.

*Remarks.*—This species is abundant along the rocky coasts of the Philippines. In the Sulu Archipelago I found the snake in large numbers on small rocky islands, usually in cracks in cliffs and under rocks. A number of specimens taken rotted from lack of proper preservatives. The snakes of this species are more terrestrial than are the other poisonous water snakes. They feed wholly on fish, usually eels. When on land they are rather helpless, and may be picked up by the tail with impunity. The species is poisonous, probably deadly to man.

In the Philippines specimens are known from Samar, southern Luzon, Bantayan, Palawan, Negros, and also from the small islands of Dipolod, Tulian, and Bubuan, in the Sulu Archipelago.

#### LATICAUDA SEMIFASCIATA (Reinwardt)

##### PLATE 3, FIG. 2; PLATE 30

*Platurus semifasciatus* REINWARDT, in Schlegel, Phys. Serp. 2 (1837) 516.

*Hydrophis colubrina* SCHLEGEL, Phys. Serp., Atlas, pl. 18, figs. 18–20; Fauna Jap., Rept. (1837) 92, pl. 10.

*Platurus fasciatus* var. *semifasciata* FISCHER, Abh. Natur. Ver. Hamburg 3 (1856) 30.

*Platurus schistorhynchus* GÜNTHER, Proc. Zool. Soc. London (1874) 297, pl. 45, fig. B; BOULENGER, Fauna Brit. India, Rept. (1890) 395; Cat. Snakes Brit. Mus. 3 (1896) 309; WALL, Proc. Zool. Soc. London (1903) 101; Mem. As. Soc. Bengal 2 (1907–10) 184, fig. 1.

*Laticauda semifasciata* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 409, pl. 22.

*Description of species.*—(From Stejneger.) “Rostral broader than high, upper edge broad and truncate, scarcely visible from above; three internasals, one unpaired anterior adjoining the rostral, of which it is in reality only a detached portion, and two posterior normal ones broadly in contact; three prefrontals, a median pentagonal one, posteriorly broadly in contact with frontal, and two lateral ones, broadly in contact with frontal

\* Rég. Anim. Atlas (by Duvernoy) pl. 36.

and with supraocular; frontal large, much longer than its distance from tip of snout and than the parietals, supraoculars as broad as frontal at the middle; parietals very short, not longer than broad, much shorter than frontal; nostril large, semilunar, near the middle of the long and narrow undivided nasal; no loreal; one preocular, broadly in contact with nasal; eye rather small, its vertical diameter less than its distance from edge of lip; two postoculars; temporals 2 + 3, only slightly differentiated from the adjacent scales; seven supralabials, third

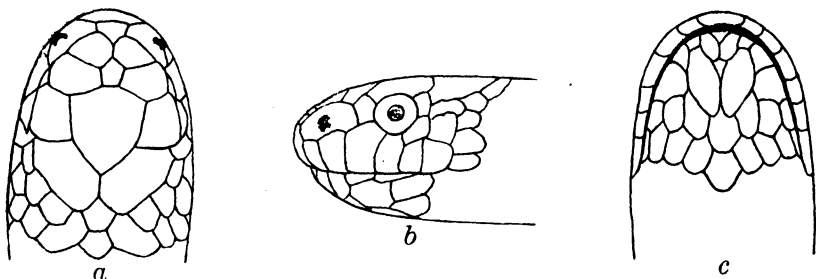


FIG. 22. *Laticauda semifasciata* (Reinwardt); after Wall; a, head, dorsal view; b, head, lateral view; c, chin.

and fourth largest and entering eye, first as wide above as below; seven lower labials, of which the first pair behind the small mental does not reach the edge of the lip, the labials from the third backward very low, only the first three in contact with chin-shields, of which only the anterior pair is clearly differentiated, the posterior being represented by two scales separated by one of nearly the same size; 23 rows of smooth scales without apical pits; 205 ventrals, on the posterior half of the body by a median blunt keel and a corresponding notch in the posterior edge of each scute; anal divided; 40 pairs of subcaudals.

*Color (in alcohol).*—"Bluish gray, darker above, paler underneath, with 43 dark brown rings around the body and seven on the tail, the bands being widest on the median line of the back, viz, about  $3\frac{1}{2}$  scales wide, and there separated by a pale interval only two scales wide; the rings are about  $2\frac{1}{2}$  ventrals wide on the underside and the light intervals about the same width; head uniform dark brown, with a yellowish horseshoe-shaped mark, the convexity of which rests on the prefrontals extending backward on the outer edge of supraoculars, upper postocular and upper temporals to and joining the first pale cross line on occiput a scale row behind the parietals; snout and labials dark brown like the rest of the head."

*Measurements of Laticauda semifasciata (Reinwardt).*

|                     | mm. |
|---------------------|-----|
| Total length        | 582 |
| Snout to vent       | 507 |
| Vent to tip of tail | 75  |

"The *young* (in alcohol) are of a light bluish gray with blackish brown rings and markings. The latter as the snake grows larger become lighter and the former darker and browner, while the demarcation between them becomes more obscure until in very large specimens the markings become almost obliterated. In the larger specimens therefore the dark gray cross markings correspond to the whitish cross markings in the young.

"This species grows to a considerable size. The largest specimen in our collection (No. 5546) measures 1,097 mm. in total length, with a tail 136 mm. long, while the type measures, respectively, 1,118 mm. and 140 mm.

"*Variation.*—There is very little variation in the scale formula proper, for only in one specimen (No. 5546) have I seen 4 temporals on one side, the normal number of 3 occurring on the other. In eastern specimens the number of ventrals is rarely as low as 188, but ranges usually between 197 and 212, while the subcaudals vary between 32 and 43 pairs. Sometimes anomalies are found in the internasals; thus in No. 10*b* of the Imperial Museum, Tokyo, there is a small unpaired shield behind the detached part of the rostral, broadly in contact with it and with the unpaired median prefrontal, and in our No. 7515 there are two unsymmetrical shields detached from the left internasal, as shown in fig. 331."

*Remarks.*—This species is included in the Philippine fauna on the strength of a specimen in Silliman Institute, Dumaguete, Oriental Negros, at which town it was captured. The specimen was examined by me in 1917, but I was unable to make an exhaustive study of it. It is very large and must measure nearly 2 meters in length.

Genus *DISTEIRA* Lacépède

*Hydrus*, part., SCHNEIDER, Hist. Amph. 1 (1799) 233; WAGLER, Syst. Amph. (1830) 165.

*Hydrophis* DAUDIN, Hist. Nat. Rept. 7 (1803) 372; GRAY, Cat. Vip. Snakes (1849) 49; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1341; GÜNTHER, Rept. Brit. India (1864) 360.

*Disteira* LACÉPÈDE, Ann. Mus. Hist. Nat. Paris 4 (1804) 210; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 418.

*Leiodelasma* LACÉPÈDE, Ann. Mus. Hist. Nat. Paris 4 (1804) 210.

*Enhydria* WAGLER, Nat. Syst. Amph. (1830) 166.

*Microcephalophis* LESSON, in Bélanger's Voy. Indes Orient., Rept. (1834) 320; Atlas, Rept. pl. 3.

- Liopata* GRAY, Zool. Misc. (1842) 60.  
*Aturia* GRAY, Zool. Misc. (1842) 61.  
*Noterophis* GISTEL, Naturg. Thierr. (1884) ix.  
*Clutulia* GRAY, Cat. Vip. Snakes (1849) 56.  
*Kerilia* GRAY, Cat. Vip. Snakes (1849) 57.  
*Thalassophis* SCHMIDT, Abh. Natur. Ver. Hamburg 2 (1852) 75.  
*Distira* COPE, Bull. U. S. Nat. Mus. 32 (1887) 61; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 285.

Maxillary longer than ectopterygoid, not extending forward as far as palatine; poison fangs large, followed by several grooved teeth; anterior mandibular teeth sometimes grooved; head usually smaller than body; nostrils superior, valved, pierced in a single nasal, which is in contact with its fellow; head shields large; preocular present; loreal usually absent; body long, slender anteriorly, frequently compressed; ventrals more or less distinct; always small.

There are few if any greater problems in herpetology than the proper classification of sea snakes, particularly those belonging to the genus *Disteira*. Boulenger\* divided the group into two genera, *Hydrophis* and *Distira*, recognizing in all forty species out of a total of nearly ninety described forms. Wall,† whose monograph on sea snakes appeared in 1911, fifteen years after Boulenger's work, relegates thirty-nine of the species, recognized by Boulenger, under a series of seventeen species of the genus *Distira* and one to a different genus, and adds to his list two other species, one of which (*Distira neglecta*) he himself described, and the other (*Distira ocellata*) is from a synonym of Boulenger's *Distira ornata*. Other species have since been described. It is obvious that the status of species of this genus is rather unstable.

Just how many species should be included in the Philippine fauna is a matter of considerable doubt. *Hydrophis abbreviatus* Jan, *H. brevis* Jan, and *H. loreata* are all referable to *Lapemis hardwickii* Gray. *Hydrophis semperi* Garman and *Hydrophis westermanni* Jan are very probably referable to *Disteira cyanocincta*; and *Disteira longiceps*, recorded by Griffin from Manila Bay, is probably *Disteira ornata*. Thus we are left with six species reported as occurring in the Philippines. These are *Disteira fasciata*, *D. cinnamati*, *D. ornata*, *D. cyanocincta*, *D. spiralis*, and *D. cyanosoma*.

I strongly suspect that Peters's record of *Hydrophis fasciatus* will have to be referred to *Disteira cinnamati*, as has been done

\* Cat. Snakes Brit. Mus. 3 (1896) 271-299.

† Mem. As. Soc. Bengal 2 (1911) 169-251.

TABLE 51.—Scale counts of the Philippine species of *Disteira*.  
VENTRALS.

| Species.                         | Ventrals.    |                |                |                  |                    | SCALE ROWS.         |                  |              |              |              |
|----------------------------------|--------------|----------------|----------------|------------------|--------------------|---------------------|------------------|--------------|--------------|--------------|
|                                  | Male limits. | Female limits. | Average.       | Species limits.  | Species average.   | Neck.               | Body.            | Head scales. | Postoculars. | Preoculars.  |
| <i>D. cinnammati</i>             | 20           | 320-365        | 345            | 323-394          | 373                | 320-394             | 361              |              |              |              |
| <i>D. ornata</i>                 | 16           | 223-243        | 232            | 242-278          | 261                | 223-278             | 245              |              |              |              |
| <i>D. cyanocincta</i>            | 17           | 320-356        | 336            | 350-398          | 360                | 320-398             | 348              |              |              |              |
| <i>D. cyanosoma</i> <sup>a</sup> | 1            | 213 (?)        |                |                  |                    |                     |                  |              |              |              |
| SCALE ROWS.                      |              |                |                |                  |                    |                     |                  |              |              |              |
| Species.                         | Neck.        |                |                | Body.            |                    |                     | Head scales.     |              |              |              |
|                                  | Male limits. | Average.       | Female limits. | Species average. | Average.           | Female limits.      | Species average. | Temporals.   | Preoculars.  | Postoculars. |
| <i>D. cinnammati</i>             | 27-28        | 27.5           | 24-29          | 27               | 41-44              | 43                  | 38-46            | 1            | 1            | 1 rarely 2   |
| <i>D. ornata</i>                 | 30-34        | 33             | 34-38          | 34               | 34-45              | 38                  | 42-45            | 2 rarely 3   | 1            | 2            |
| <i>D. cyanocincta</i>            | 29-31        | 30             | 28-33          | 30               | 36-39              | 37.5                | 36-40            | 2 rarely 3   | 1            | 2            |
| <i>D. cyanosoma</i> <sup>a</sup> | 33           |                |                |                  | 37                 |                     |                  | 2-3          | 1            | 2            |
| SCALE ROWS.                      |              |                |                |                  |                    |                     |                  |              |              |              |
| Species.                         | Prenals.     |                | Upper labials. |                  | Labials enter eye. |                     | Temporals.       |              | Preoculars.  |              |
|                                  | Males.       | Females.       | 4              | 6 rarely 7 or 8  | 3, 4               | 3, 4 rarely 3, 4, 5 | 1                | 2 rarely 3   | 1            | 1 rarely 2   |
| <i>D. cinnammati</i>             | 4 rarely 5   | 4              | 4              | 6 rarely 7 or 8  | 3, 4               | 3, 4 rarely 3, 4, 5 | 1                | 2 rarely 3   | 1            | 1 rarely 2   |
| <i>D. ornata</i>                 | 6            | 4              | 4              | 7-8              | 3, 4               | 3, 4 rarely 3, 4, 5 | 1                | 2 rarely 3   | 1            | 2            |
| <i>D. cyanocincta</i>            | 2 or 4       | 2 or 4         | 2 or 4         | 7 rarely 8       | 3, 4 or 3, 4, 5    | 3, 4 or 3, 4, 5     | 1                | 2 rarely 3   | 1            | 2            |
| <i>D. cyanosoma</i> <sup>a</sup> | ?            | ?              | ?              | 8                | 3, 4               | 3, 4                | 1                | 2-3          | 1            | 2            |

<sup>a</sup> From type.

with Boettger's record for the same species. There appears to be but a single record for *D. spiralis* from Manila, that of Jan. I strongly suspect that that specimen is an abnormal *D. cyanocincta* with a single anterior temporal. As a result of this elimination, four species remain whose status is stable, and which undoubtedly occur in the Philippines. These are *D. cyanocincta*, *D. cincinnatii*, *D. cyanosoma*, and *D. ornatus*. The last-named species belongs to the variety *D. inornata* of Gray. Table 51 will serve as a key for species found in the Philippines.

**DISTEIRA CINCINNATII Van Denburgh and Thompson**

*Disteira cincinnatii* VAN DENBURGH and THOMPSON, Proc. Cal. Acad. Sci. IV 3 (1908) 41, pl. 7; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 264.

*Description of species.*—(From No. 1327, E. H. Taylor collection; collected in Manila Bay, October, 1914, by E. H. Taylor.) (Male.) Body compressed, tail flattened; head small, not dis-

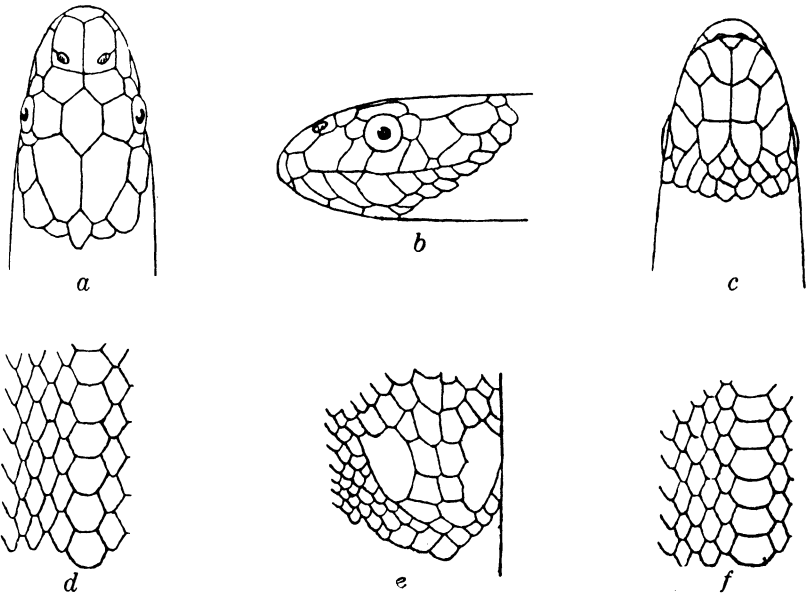


FIG. 23. *Disteira cincinnatii* Van Denburgh and Thompson; after Van Denburgh and Thompson; a, head, dorsal view; b, head, lateral view; c, chin; d, anterior ventrals; e, anal region; f, ventrals.

tinct from neck; depth of neck contained in greatest body depth nearly three times; head tapering, rather convex above; eyes large; rostral about as deep as broad, distinctly visible from above; internasal absent; nasals large, nearly quadrangular, longer than wide, nostril pierced near its outer posterior edge

and connected with outer and posterior sutures by shallow grooves; prefrontals broader than deep, touching second labials laterally, their mutual suture little less than one-third that between nasals; frontal small, longer than broad, as wide as supraoculars and scarcely longer; parietals elongate, in contact for three-fourths of their length; upper labials 6 (5 on right side), first small, second largest, fifth triangular, third and fourth broadly entering eye; preocular small; 1 postocular; temporals 1+1; 8 lower labials (9 on left side), fourth a very small scale widely separated from chin shields; mental very small; first pair of labials of same size as second chin shields; 3 labials in contact with anterior chin shields, which are shorter and wider than second pair; latter in contact, bordered by 2 labials; 28 scale rows around neck, 40 around widest part of body, 32 around widest part of tail; scales subimbricate anteriorly but juxtaposed posteriorly, each with a small indistinct tubercle; ventrals, 367, about twice as wide as adjoining scale rows, the last 5 divided; 4 anals, a small inner pair and a large outer pair; 64 subcaudals.

*Color*.—Head entirely black, neck black with narrow bars not meeting below; body brownish black, the bars of yellowish white growing wider on sides, meeting or barely failing to meet below, very much obscured dorsally; tail black with 5 bars of light color; last 2 scarcely formed; 47 light bands on body, 5 on tail.

*Measurements of Disteira cincinnatii Van Denburgh and Thompson.*

|                | mm.  |
|----------------|------|
| Total length   | 645  |
| Snout to vent  | 575  |
| Tail           | 70   |
| Length of head | 10.5 |
| Width of head  | 6    |
| Width of neck  | 6    |
| Depth of body  | 19   |
| Depth of tail  | 11   |

*Variation*.—Van Denburgh and Thompson give measurements and scale counts for twenty specimens of this species. The scale counts average as follows: Neck rows, 27; body, 42; ventrals, 361. The average number of bands on body is 45, on tail, 4. These authors report the following differences between this species and *Disteira fasciata* Schneider and *D. brookii* Boulenger:

This species is closely related to *D. fasciata* Schneider and *D. brookii* Boulenger. From *D. fasciata* it differs in being much stouter; in the narrow portion of the neck being shorter; in the lower average \* number of gastrosteges; in the arching of the maxilla between the fang and the first tooth and the absence of an acute apex in front of the fangs; and in the less acute posterior angle of the frontal plate. From *D. brookii* it differs in the lower average number of gastrosteges; in the character of the scales on the sides of the body, which are mostly regular hexagons or are a trifle broader than long, where in *D. brookii* the upper and lower angles of the scales are very acute and the laterals are twice the size of the scales on the back. In *D. brookii* the snout is much broader.

*Remarks.*—The type is from Manila Bay, collected in 1906 by Thompson. The species is not rare apparently, but is not frequently taken in fishing nets, due to its small size. It is poisonous, but due to the extremely small size of the head probably could not be considered deadly to man. It is said to feed on small eels. Known only from Manila Bay.

#### DISTEIRA ORNATA (Gray)

*Aturia ornata* GRAY, Zool. Misc. (1842) 61.

*Clutulia inornata* GRAY, Cat. Vip. Snakes (1849) 56.

*Disteira ornata*, part., BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 290, sp. b and d.

*Hydrophis ornatus*, part., GÜNTHER, Rept. Brit. India (1864) 376, pl. 25, fig. v.

*Disteira ornata inornata* WALL, Mem. As. Soc. Bengal 2 (1911) 169–251.

*Disteira ornata* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 265.

*Description of species.*—(From No. 784, Bureau of Science collection; collected in Manila Bay, 1911, by T. Bangis.) Body strongly compressed; head elongate, about one-fifth wider than neck; rostral wider than high, doubly arched below, with a slight suture (anomalous) entering from above; suture with internasals wider than that with labials; no internasals; nasals elongate, the nostril pierced in outer posterior part, a suture issuing from lower side and continuing to second labial; a dim groove from posterior part of nostril to prefrontal; prefrontals wider than deep, the suture between them one-third that between nasals, in contact laterally with second labial; frontal longer than its distance from rostral, more than one and a half times as long as wide, much shorter than parietals, one and a half times as wide as supraoculars; parietals elongate, twice as long

\* Average in twenty specimens of *D. cincinnatii* is 361, while in twenty-six of *D. fasciata* it is 417.

as wide; 1 preocular in contact with 2 labials; 2 postoculars; 2 anterior temporals; 8 upper labials, second largest, third and fourth entering eye, sixth, seventh, and eighth very small; mental small, triangular, wedge-shaped; 9 lower labials, last 2 very small (on right side fourth is broken and two small parts border mouth); first pair of labials broadly in contact, partially inserted between anterior chin shields; latter in contact posteriorly; second pair distinct, separated from each other by 2 scales; 3 labials border first pair, and 2 or 3 the second pair; scales juxtaposed, usually six-sided, each with a small tubercle;

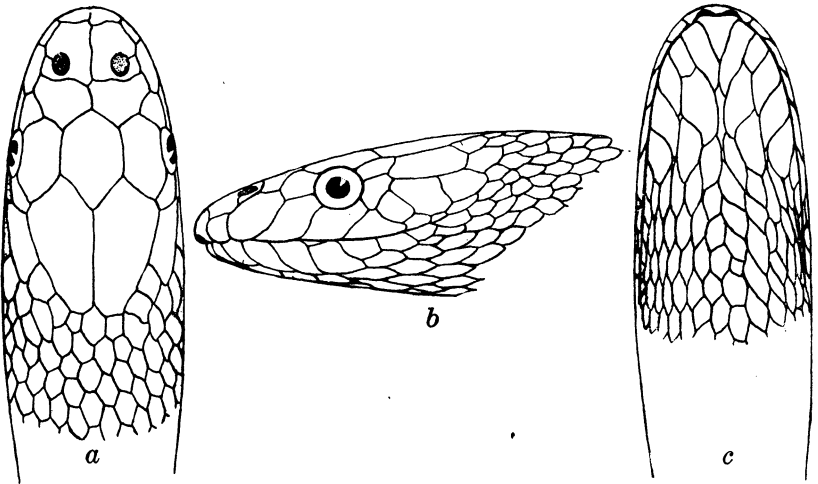


FIG. 24. *Disteyra ornata* (Gray); drawing of a specimen from Manila Bay; a, head, dorsal view; b, head, lateral view; c, head, ventral view.  $\times 2$ .

34 scale rows on neck; 41 on widest part of body; 25 on widest part of tail; ventrals, 243, somewhat enlarged but frequently divided on posterior part of body; anus bordered by 3 pairs of scales, the outer pair largest; ventrals grooved, usually with a tubercle on each side; 44 subcaudals, not differentiated; tail strongly compressed, widened at base behind anus.

*Color in life.*—Above grayish blue, neck traversed by a few, very narrow, lighter lines; the blue extends down about halfway on side, below which the color is uniform yellowish white; tail grayish with eight dim, narrow, yellowish white bars; the division between dorsal and ventral color usually a straight line, but in the posterior part the demarcation line is zigzag; head slate blue; rather lavender on chin.

*Measurements of Disteira ornata (Gray).*

|                |            |
|----------------|------------|
| Total length   | mm.<br>763 |
| Snout to vent  | 676        |
| Tail           | 87         |
| Length of head | 30         |
| Width of head  | 12         |
| Depth of neck  | 10         |
| Depth of body  | 20         |
| Depth of tail  | 15.5       |

*Variation.*—The chief variation is sexual, as the table shows. Males are slenderer, with tails less compressed at base and somewhat longer; they are much more strongly tuberculate than females. The males average 231 ventrals; 33 scale rows on neck; 39 scale rows on widest part of body; and 24 around tail. Females average 262.5 ventrals; 34.6 scale rows on neck; 44 on body; and 25 on tail. The females have only 2 pairs of anals, instead of 3 pairs as in the males, and the nasal scale is, usually, entirely broken in two. Several adult females show no evidence of tuberculation on scales. The specimen figured by Günther \* (the type of Gray's *Clutulia inornata*) is typically identical with Philippine specimens, as characterized by the

TABLE 52.—*Measurements and scale counts of Disteira ornata (Gray).*

| No.      | Locality.       | Collector.        | Sex. | Length.<br>mm. | Tail.<br>mm. | Head length.<br>mm. | Head width.<br>mm. | Neck width.<br>mm. | Depth, body.<br>mm. | Depth, tail.<br>mm. |
|----------|-----------------|-------------------|------|----------------|--------------|---------------------|--------------------|--------------------|---------------------|---------------------|
| 778..... | Manila Bay..... | T. Bangis.....    | ♂    | 720            | 83           | 28                  | 13                 | 11.5               | 24.5                | 14.5                |
| 779..... | do.....         | do.....           | ♀    | 695            | 72           | 27                  | 12                 | 10                 | 28                  | 14                  |
| 780..... | do.....         | do.....           | ♀    | 795            | 77           | 27                  | 13                 | 11                 | 31                  | 15                  |
| 781..... | do.....         | do.....           | ♀    | 720            | 82           | 27                  | 13                 | 10                 | 82                  | 14                  |
| 782..... | do.....         | do.....           | ♂    | 510            | 57           | 20                  | 10                 | 8                  | 16                  | 10                  |
| 783..... | do.....         | do.....           | ♀    | 740            | 73           | 27                  | 12                 | 10.5               | 35                  | 14                  |
| 784..... | do.....         | do.....           | ♂    | 763            | 87           | 30                  | 12                 | 10                 | 20                  | 15.5                |
| 785..... | do.....         | do.....           | ♀    | 656            | 70           | 24                  | 14                 | 11                 | 22                  | 14                  |
| 786..... | do.....         | do.....           | ♂    | 510            | 56           | 20                  | 10                 | 9                  | 19                  | 12                  |
| 787..... | do.....         | do.....           | ♂    | 802            | 94           | 28                  | 12.5               | 11.5               | 24                  | 15                  |
| 819..... | do.....         | E. H. Taylor..... | ♂    | 365            | 46           | 15                  | 8                  | 6                  | 14                  | 9                   |
| 820..... | do.....         | do.....           | ♀    | 420            | 48           | 20                  | 10                 | 9                  | 17                  | 11                  |
| 821..... | do.....         | do.....           | ♂    | 350            | 45           | 16                  | 7                  | 5.5                | 11                  | 9                   |
| 822..... | do.....         | do.....           | ♂    | 320            | (a)          | 18                  | 8.5                | 6                  | 17                  | -----               |
| 825..... | do.....         | do.....           | ♂    | 395            | 48           | 18                  | 8.5                | 7                  | 16                  | 12                  |
| 130..... | do.....         | do.....           | ♀    | 390            | 43           | 18                  | 7.5                | 7                  | 15                  | 9                   |

a Mutilated.

\* Rept. Brit. India (1864) pl. 25, fig. v.

TABLE 52.—*Measurements and scale counts of Disteyra ornata* (Gray)—Continued.

| No.      | Ven-<br>trals. | Sub-<br>cau-<br>dals. | Scale rows. |       |       | Anals. | Labials. |        |               |                           |
|----------|----------------|-----------------------|-------------|-------|-------|--------|----------|--------|---------------|---------------------------|
|          |                |                       | Neck.       | Body. | Tail. |        | Upper.   | Lower. | Enter<br>eye. | Touch<br>chin<br>shields. |
| 778..... | 227            | 43                    | 33          | 38    | 24    | 6      | 7        | 9      | 3, 4          | 3                         |
| 779..... | 259            | 39                    | 35          | 44    | 26    | 4      | 7        | 9      | 3, 4          | 3                         |
| 780..... | 260            | 38                    | 35          | 45    | 27    | 4      | 8        | 9-10   | 3, 4          | 3                         |
| 781..... | 242            | 42                    | 34          | 42    | 22    | 4      | 7-8      | 9      | 3, 4          | 3                         |
| 782..... | 229            | 40                    | 34          | 40    | 23    | 6      | 7        | 8      | 3, 4          | 3                         |
| 783..... | 273            | 39                    | 34          | 45    | 24    | 4      | 7        | 9      | 3, 4          | 3                         |
| 784..... | 243            | 44                    | 34          | 41    | 25    | 6      | 8        | 9      | 3, 4          | 3                         |
| 785..... | 278            | 38                    | 36          | 45    | 25    | 4      | 8        | 9      | 3, 4          | 3                         |
| 786..... | 223            | 42                    | 35          | 38    | 25    | 6      | 7        | 9-8    | 3, 4          | 3                         |
| 787..... | 234            | 43                    | 31          | 37    | 23    | 6      | 8        | 9      | 3, 4          | 3                         |
| 819..... | 224            | 42                    | 30          | 34    | ----- | 6      | 7        | 8      | 3, 4          | 3                         |
| 820..... | 252            | 44                    | 35          | 43    | ----- | 4      | 8        | 9      | 3, 4          | 3                         |
| 821..... | 242            | 42                    | 32          | 38    | ----- | 6      | 7-8      | 8      | 3, 4          | 3                         |
| 822..... | 239            | (a)                   | 38          | 44    | ----- | 6      | 8        | 10     | 3, 4          | 3                         |
| 825..... | 231            | 41                    | 34          | 38    | ----- | 6      | 8        | 9      | 3, 4, 5       | 3                         |
| 130..... | 264            | 40                    | 34          | 45    | 26    | 4      | 8        | 9      | 3, 4          | 4                         |

| No.      | An-<br>terior<br>tempo-<br>rals. | Nasal divided.  | Prefrontals<br>touch second<br>labial. | Second pair of<br>chin shields<br>separated. | Collection.        |
|----------|----------------------------------|-----------------|--|--|--------------------|
| 778..... | 3                                | Partially ..... | On one side....                        | Yes.....                                     | Bureau of Science. |
| 779..... | 2-3                              | Yes.....        | On one side....                        | do.....                                      | Do.                |
| 780..... | 3                                | do.....         | No.....                                | do.....                                      | Do.                |
| 781..... | 2                                | do.....         | Yes.....                               | do.....                                      | Do.                |
| 782..... | 2                                | Partially ..... | do.....                                | do.....                                      | Do.                |
| 783..... | 2                                | Yes.....        | do.....                                | do.....                                      | Do.                |
| 784..... | 2                                | Partially ..... | do.....                                | do.....                                      | Do.                |
| 785..... | 2                                | Yes.....        | do.....                                | do.....                                      | Do.                |
| 786..... | 3-2                              | Partially ..... | do.....                                | do.....                                      | Do.                |
| 787..... | 2                                | do.....         | do.....                                | do.....                                      | Do.                |
| 819..... | 3                                | Partially ..... | do.....                                | do.....                                      | E. H. Taylor.      |
| 820..... | 2                                | Yes.....        | Yes.....                               | do.....                                      | Do.                |
| 821..... | 2                                | Partially ..... | do.....                                | do.....                                      | Do.                |
| 822..... | 2                                | do.....         | do.....                                | do.....                                      | Do.                |
| 825..... | 2-3                              | do.....         | Yes.....                               | do.....                                      | Do.                |
| 130..... | 2                                | Yes.....        | do.....                                | do.....                                      | Do.                |

<sup>a</sup> Mutilated.

upper labials, the separation of the second pair of chin shields, the temporals, and the narrow lower labials. No other variety of *Disteyra ornata* appears to have been discovered in the Philippines. I strongly suspect that this Philippine form merits specific designation. In young males the narrow whitish bands on the neck are evident, and they sometimes persist in adult specimens. Young females are colored like the adults.

*Remarks.*—This species is common in Manila Bay, where it is known as *malabasahan* and *calabucab*. It feeds for the most part on eels. Specimens kept in the Bureau of Science aquarium when very hungry will eat small dead fish. They rarely live more than three months in captivity.

The species is poisonous, probably deadly to man. Known from Manila Bay and Palawan. Widely distributed from south-eastern Asia throughout the Malay Archipelago.

#### DISTEIRA CYANOCINCTA (Daudin)

*Hydrophis cyanocinctus* DAUDIN, Hist. Nat. Rept. 7 (1803) 383; PETERS, Mon. Berl. Ak. (1872) 852, pl. 1, fig. 2; FAYRER, Thanatoph. Ind. (1874) pl. 23; MURRAY, Zool. Sind. (1884) 391; BOETTGER, Offenb. Ver. Nat. (1888) 89.

*Leioselasma striata* LACÉPÈDE, Ann. Mus. Hist. Nat. 4 (1804) 198, 210, pl. 57, fig. 1.

*Enhydriis cyanocinctus* MERREM, Tent. Syst. Amph. (1820) 141.

*Enhydriis striatus* MERREM, Tent. Syst. Amph. (1820) 141.

*Hydrus cyanocinctus* BOIE, Isis (1827) 354.

*Hydrophis striata* SCHLEGEL, Fauna Japon., Rept. (1837) 89, pl. 7; Phys. Serp. 2 (1837) 502, pl. 18, figs. 4 and 5; FISCHER, Abh. Naturw. Hamburg 3 (1856) 41; OKADA, Cat. Vert. Japan (1891) 69.

*Hydrus striatus*, part., CANTOR, Cat. Mal. Rept. (1847) 126.

*Hydrophis subannulata* GRAY, Cat. Vip. Snakes (1849) 54.

*Hydrophis chittal* RAFINESQUE, Am. Month. Mag. (1817) 432.

*Hydrophis aspera* GRAY, Cat. Vip. Snakes (1849) 55; GÜNTHER, Rept. Brit. India (1864) 365.

*Hydrophis cyanocincta*, part., GÜNTHER, Rept. Brit. India (1864) 367.

*Hydrophis trachyceps*, THEOBALD, Cat. Rept. As. Soc. Mus. (1868) 70.

*Hydrophis crassicolis* ANDERSON, Journ. As. Soc. Bengal 40 (1871) 19.

*Hydrophis westermanni* JAN, Rev. Mag. Zool. (1859); Icon. Gén. (1872) livr. 39, pl. 5, fig. 1; Elenco Sist. Ofid. (1863) 111.

*Hydrophis phipsoni* MURRAY, Journ. Bombay Nat. Hist. Soc. 2 (1887) 32, pl.

*Hydrophis (Hydrophis) cyanocinctus* BOETTGER, Zool. Anz. 11 (1888) 396 (Philippines).

*Hydrophis taprobanica* HALY, Taprobanian 2 (1887) 107.

*Distira cyanocincta* BOULENGER, Fauna Brit. India, Rept. (1890) 410; SCLATER, Journ. As. Soc. Bengal 60 (1891) 247; BOETTGER, Ber. Offenb. Ver. Nat. (1892) 90; BOULENGER, Cat. Snakes, Brit. Mus. 3 (1896) 294; WEST, Proc. Zool. Soc. London (1895) 823, pl. 66, figs. 1, 8, 17; WALL, Proc. Zool. Soc. London (1903) 96, 101; BOETTGER, Ber. Senck. Nat. Ges. (1898) xxxviii (1905) 170 (Philippines).

*Disteira cyanocincta* STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 428; Proc. U. S. Nat. Mus. 38 (1911) 111.

*Description of species.*—(Adult male.) Head not distinct from neck; rostral broad, pentagonal, well visible above, forming nearly equal sutures with nasals and labials; nostril pierced

in the outer posterior part of nasal with a suture reaching from it to second labial; nasals large, in contact the greater part of their length; prefrontals broader than long, touching second labials; frontal longer than wide, not as long as its distance from rostral, wider than supraoculars; parietals longer than frontals, touching superior postocular and bordered by 3 temporals, first largest; 1 small preocular; 2 postoculars; 8 upper labials, second very large, touching nasal, prefrontal, and pre-

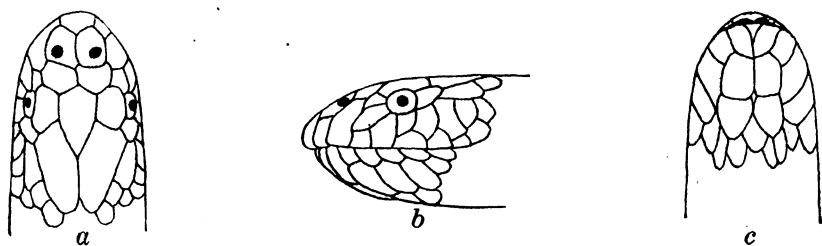


FIG. 25. *Distieira cyanocincta* (Daudin); after Wall; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

ocular, third, fourth, and fifth entering orbit, seventh smallest; 2 anterior temporals, the lower followed by the eighth upper labial; 9 lower labials, the 2 anterior largest, touching first pair of chin shields which are smaller than second pair; latter in contact half their length; lower labials from third to ninth small, separated from chin shields by 3 large scales, the third of which is slightly separated from the second pair of chin shields; scales imbricating, pointed more or less posteriorly on anterior part of body, truncate on posterior part of body, each scale with a distinct keel or tubercle; scales largest lateroventrally; ventrals small, usually a half wider than adjoining scale rows, equipped with 2 or more tubercles; ventrals, 237; anals, 2 pairs, outer largest, not in contact; subcaudals, 49; 31 scale rows on neck, 39 on body, 26 on tail; scute on tip of tail large.

*Measurements of Distieira cyanocincta (Daudin).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,080 |
| Snout to vent  | 992   |
| Tail           | 88    |
| Length of head | 25    |
| Width of head  | 13    |
| Depth of neck  | 13    |
| Depth of body  | 28    |
| Depth of tail  | 23    |

*Color in life.*—Above dull blue, the body traversed by 52 yellow-white bars, very dim dorsally, distinct ventrally; tail with

5 bars, only the first 2 extending to underpart of tail. Head greenish black, throat and neck black, the black interrupting the light bars from above.

*Variation.*—Variations in scale counts evident in Philippine specimens are: Ventrals, 320 to 398; scale rows on neck, 29 to 33; scale rows on body, 36 to 40. For extra-Philippine specimens, Boulenger gives the following limits: Ventrals, 281 to 385; scale rows on neck, 27 to 33; scale rows around body, 39 to 45.

Specimen No. 798, Bureau of Science collection, has only 2 labials entering eye, but there is a fusion of the fourth and fifth labials; No. 800, Bureau of Science collection, has the sixth labial broken, making 3 anterior temporals; a specimen consisting merely of the head of a very large snake, has the same arrangement of temporals as the preceding, only 2 labials enter the eye, and there are only 7 upper labials. This head measures 43 millimeters in length, and 29 in width. No. 797, Bureau of Science collection, has 3 anterior temporals; the fifth labial of this specimen is broken transversely, the upper part entering eye.

TABLE 53.—*Measurements and scale counts of Disteira cyanocincta (Daudin).*

| No.    | Sex. | Locality. | Collector.   | Length. | Tail. | Ventrals. | Subcaudals. | Scale rows. |       |
|--------|------|-----------|--------------|---------|-------|-----------|-------------|-------------|-------|
|        |      |           |              |         |       |           |             | Body.       | Neck. |
|        |      |           |              | mm.     | mm.   |           |             |             |       |
| 797    | ♀    | Manila    | T. Bangis    | 1,255   | 91    | 358       | 45          | 41          | 31    |
| 798    | ♀    | do        | do           | 945     | (a)   | 356       |             | 36          | 29    |
| 800    | ♀    | do        | do           | 670     | 56    | 350       | 48          | 40          | 30    |
| 1102   | ♀    | do        | E. H. Taylor | 1,140   | 84    | 352       | 45          | 40          | 28    |
| 1103   | ♂    | do        | do           | 1,073   | 98    | 356       | 53          | 36          | 29    |
| 1104   | ♂    | do        | do           | 476     | 43    | 356       | 49          | 37          | 28    |
| b 1105 |      |           |              |         |       |           |             |             | 31    |

| No.    | Upper labials. | Lower labials. | Labials enter eye. | Pre-oculars. | Post-oculars. | Temporals. | Anal. | Bands. | Collection.        |
|--------|----------------|----------------|--------------------|--------------|---------------|------------|-------|--------|--------------------|
| 797    | 7              | 8-9            | 3, 4, 5            | 1            | 2             | 2+2        | 2     | 63     | Bureau of Science. |
| 798    | 7              | 8-8            | 3, 4               | 1            | 2             | 2+2        | 2     | 58     | Do.                |
| 800    | 8              | 9-8            | 3, 4, 5            | 1            | 2             | 3-3        | 4     | 54     | Do.                |
| 1102   | 8              | 8-9            | 3, 4, 5            | 1            | 2             | 2+2        | 4     | 57     | E. H. Taylor.      |
| 1103   | 8-7            | 8-9            | 3, 4, 5            | 1            | 2             | 2+2        | 4     | 68     | Do.                |
| 1104   | 7              | 9-9            | 3, 4               | 1            | 2             | 2+2        | 6     | 68     | Do.                |
| b 1105 | 7              | 9-10           | 3, 4               | 1            | 2             | 3+3        |       |        | Do.                |

<sup>a</sup> Mutilated.

<sup>b</sup> Head only.

*Remarks.*—This species is fairly common about Manila Bay. Dead snakes are frequently found along the beach where they

have been killed by fishermen. A few specimens have been kept alive at various times in the Bureau of Science aquarium.

It is significant that this species enters Lake Taal, a fresh-water lake connected with the sea by a river only a few kilometers long. From this locality Semper obtained specimens, one of which became the type of Garman's *Hydrophis semperi*. A careful reading of Garman's description "seventh [labial] smallest, and separated from the temporal by a large pentagonal plate" shows the presence of 2 temporals, the "plate" apparently being the second temporal.

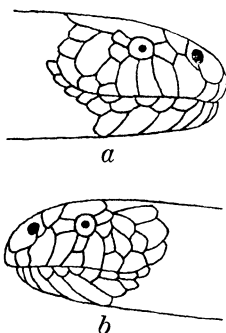


FIG. 26. *Disteira cyanocincta* (Daudin); after Jan's *D. westermanni*; a, head, lateral view; b, head, lateral view (variation).

#### DISTEIRA CYANOSOMA Wall

*Disteira cyanosoma* WALL, Journ. Bombay Nat. Hist. Soc. 22 (1913) 516.

*Description of species.*—(After the type description.) Rostral broader than high, in contact with 4 shields; nasals in contact with each other; suture from nostril passing to second supralabial; 2 prefrontals in contact with second supralabial; frontal touches 6 shields, frontoparietal sutures rather the longest; parietals entire; 1 preocular; 2 postoculars; 2 temporals on right side, 3 on left side, all longer than high; 8 supralabials, third and fourth touching the eye, sixth and seventh small, eighth elongate; 2 pairs of chin shields, subequal, the posterior pair quite separated by small scales; 4 lower labials, fourth largest, a cuneate scale wedged between third and fourth; 33 scale rows on neck, 37 in middle of body, 35 a short distance in front of anus; scales subimbricate, faintly tuberculate; ventrals, 213 (?) \* enlarged, entire, not quite twice the width of the last row of scales.

*Color.*—Uniformly bluish, deeper dorsally, paler on sides and on belly.

*Remarks.*—No measurements of this species are given; since the number of scale rows on the neck is only four less than in midbody it is safe to suppose that the species does not belong to the small-headed, narrow-necked group of this genus.

The species was sent from the Philippines, but the exact locality is not recorded. Wall states that it bears a pronounced

\* Wall's query.

superficial resemblance to *Enhydrina valakadyn* (Boie). I have found no specimens that are referable to this species.

### Genus LAPEMIS Gray

*Enhydris*, part., MERREM, Tent. Syst. Amph. (1820) 140 (not of Latreille 1802).

*Hydrophis*, part., SCHLEGEL, Phys. Serp. 2 (1837) 512; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1341; JAN, Elenco Sist. Ofid. (1863) 109; GÜNTHER, Rept. Brit. India (1864) 360.

*Lapemis* GRAY, Ill. Ind. Zool. 2 (1834) pl. 87, fig. 2; Zool. Misc. (1842) 60; Cat. Vip. Snakes (1849) 43; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 435.

*Pelamis*, part., FISCHER, Abh. Naturw. Hamburg 3 (1856) 61.

*Enhydris* BOULENGER, Fauna Brit. India, Rept. (1890) 393; Cat. Snakes Brit. Mus. 3 (1896) 300; WALL, Mem. As. Soc. Bengal 2 (1907-10) 246.

"Maxillary as long as the ectopterygoid, extending forwards as far as the palatine, with two large poison-fangs and 2 to 4 small feebly-grooved teeth. Nostrils superior; head-shields large; nasals in contact with each other; a præocular; loreal present or absent. Body short and stout; scales hexagonal or squarish, juxtaposed; ventrals very feebly developed, if at all distinct." (*Boulenger.*)

Two species of this genus are known, *Lapemis curtus* Shaw, confined to the coasts of India and Ceylon, and *Lapemis hardwickii* Gray, which is found in the Bay of Bengal and the waters bounding the Malay Peninsula and Malay Archipelago. The latter species is the commonest water snake in Manila Bay, as many as a hundred being brought in with a single haul of a net in the shallow water along the coast. The snakes may be seen swimming in the water or coming to the surface to breathe about the swimming rafts on Pasay Beach.

### LAPEMIS HARDWICKII Gray

*Lapemis hardwickii* GRAY, Ill. Ind. Zool. 2 (1834) pl. 87, fig. 2; Cat. Vip. Snakes (1849) 44; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 435.

*Hydrophis pelamidoides* SCHLEGEL, Phys. Serp. 2 (1837) 512, Atlas, pl. 18, figs. 16, 17; Fauna Jap., Rept. (1838) pl. 9; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1345; FISCHER, Abh. Naturw. Hamburg (1856) 64, pl. 3; JAN, Icon. Gén. (1872) livr. 41, pl. 3, fig. 1.

*Lapemis loreatus* GRAY, Ann. & Mag. Nat. Hist. 11 (1843) 46.

*Hydrophis hardwickii* GÜNTHER, Rept. Brit. India (1864) 380, pl. 25, fig. W.; ANDERSON, Journ. Linn. Soc. 21 (1889) 348.

*Hydrophis loreata* GÜNTHER, Rept. Brit. India (1864) 380; BOETTGER, Zool. Anz. (1888) 396.

*Hydrophis fayreriana*, ANDERSON, Journ. As. Soc. Bengal 40 (1871) 19.

*Hydrophis problematicus* JAN, Rev. & Mag. Zool. (1859) 150 (Manila?).

*Hydrophis brevis* JAN, Elenco Sist. Ofid. (1863) 109 (Manila).

*Hydrophis abbreviatus* JAN, Elenco Sist. Ofid. (1863) 109 (Manila);  
Icon. Ophid. (1872) livr. 40, pl. 4, fig. 2.

*Enhydryis hardwickii* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896)  
301; Fauna Brit. India, Rept. (1890) 397; WALL, Mem. As. Soc.  
Bengal 2 (1907-10) 247.

*Hydrophis (Thalassophis) loreatus* BOETTGER, Zool. Anz. 11 (1888)  
396 (Mindanao and Luzon).

*Description of species.*—(From No. 636, Bureau of Science collection; collected in Manila Bay, by T. Bangis.) (Adult female.) Head moderate; nostrils superior; rostral not visible from above, slightly higher than broad, with a short suture entering from above; nasals large, longer than wide, forming a long mutual suture; a suture runs from nostril to anterior part of second labial, and a second from nostril to prefrontal, completely dividing the scale; prefrontals much wider than long, touching second labial, their mutual suture as long as their sutures with frontal; frontal longer than wide, pointed sharply

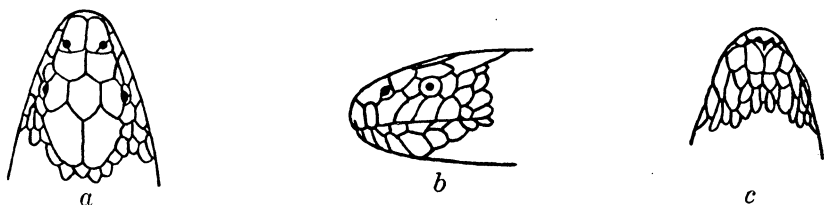


FIG. 27. *Lapemis hardwickii* Gray; after Günther; a, head, dorsal view; b, head, lateral view; c, chin.

behind, distinctly shorter than its distance from end of snout; supraoculars longer than broad; parietals elongate, very much longer than broad, touching postocular on one side only; 7 upper labials, the second largest and highest, touching anterior part of nasal; third and fourth labials enter eye, sixth and seventh small, wider than high; 2 large anterior temporals followed by 3 smaller ones; 3 pairs of small chin shields, only the first pair in contact; second and third pairs separated by 3 rows of small scales; mental small, triangular; third labial separated from edge of mouth by 2 small scales; fourth lower labial largest; posterior lower labials bent over edge of mouth; scales on body six-sided, with a distinct keel on anterior part of each; scales in 34 rows around neck; 41 rows around deepest part of body, 26 rows around deepest part of tail; ventrals about 186, small, keeled, scarcely discernible from body scales, usually with 2 tubercular keels; subcaudals, 33; 4 anal scales, 2 outer largest; anals preceded by several small differentiated scales.

*Color in alcohol.*—Above, banded with bluish black and light bands, about 39 of each, from head to tail; on back the black bands are 5 scales wide, the light bands about 2 scales wide; the black bands narrow rapidly, and midway on sides they are only 2 or 3 scales wide; the white bands widen on sides proportionally as the black bands decrease in width; the black bands widen again on belly; tail largely black, the white bands not extending more than halfway down on sides of tail.

*Measurements of Lapemis hardwickii Gray.*

|                        | mm. |
|------------------------|-----|
| Total length           | 762 |
| Snout to vent          | 689 |
| Tail                   | 73  |
| Depth of neck          | 23  |
| Greatest depth of body | 43  |
| Depth of tail          | 24  |
| Length of head         | 34  |
| Width of head          | 25  |

*Variation.*—A remarkable amount of variation is evident in this species, and the sexes differ markedly. Boettger gives the following variation in scale counts. Males: Ventrals, 135 to 168, average, 153; scale rows, 25 to 31, average, 28. Females: Ventrals, 186 to 237, average, 202; scale rows, 29 to 36, average, 31. In specimens that I examined the ventrals varied between 130 and 230; and the scale rows, between 24 and 41.

Of about one hundred fifty specimens examined about sixty had one or more loreals present on one or both sides (*Hydrophis loreata*). The loreal is usually formed from the anterior part of second labial; sometimes it is fused with preocular, in which case the latter touches nasal; sometimes the loreal fuses with the lower part of nasal, sometimes with a second loreal formed from the upper part of first labial. Not infrequently specimens are found with one or two loreals on one side and none on the other. The frontal varies greatly in length; sometimes it is as long as its distance from snout, at other times it is scarcely half as long. One or two preoculars are present. The suture from nostril goes with about equal frequency to first and second labials; there are usually two anterior temporals but not infrequently the temporals are fused into one scale.

The markings are variable also. The number of dark bands varies between 28 and 41; they may encircle body or may be joined on back not extending the full length of side; sometimes the bands are joined by a black line following the ventrals; the bands may be wide or narrow.

*Remarks.*—The species is incredibly numerous in Manila Bay. I have kept as many as fifty living specimens in the aquarium at one time. They do not do well in captivity and seldom live for more than a few months. To obtain the proper sort of food for them is a problem.

Most of the Philippine records for this species are for Manila. I have taken specimens at Hinigaran, on Negros. It probably occurs with greater or less frequency on the coasts of all of the islands. Outside of the Philippines it occurs from the Bay of Bengal to New Guinea.

### Genus PELAMYDRUS Stejneger

*Hydrus*, part., SCHNEIDER, Hist. Amph. 1 (1799) 233.

*Pelamis*, part., DAUDIN, Hist. Rept. 7 (1803) 357; FISCHER, Abh. Naturw. Hamburg 3 (1856) 61.

*Pelamis* FITZINGER, Neue Class. Rept. (1826) 29; WAGLER, Syst. Amph. (1830) 165; GRAY, Cat. Vip. Snakes (1849) 41; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1333; GÜNTHER, Rept. Brit. India (1864) 382; BOETTGER, Ber. Senck. Nat. Ges. (1886) 119; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 443.

*Hydrophis*, part., SCHLEGEL, Phys. Serp. 2 (1837) 488; JAN, Elenco Sist. Ofid. (1863) 109.

*Thalassophis*, part., SCHMIDT, Abh. Naturw. Hamburg 2 (1852) 75.

*Hydrus* BOULENGER, Fauna Brit. India, Rept. (1890) 397; Cat. Snakes Brit. Mus. 3 (1896) 266.

*Pelamydrus* STEJNEGER, Proc. U. S. Nat. Mus. 38 (1911) 111.

“Maxillary longer than the ectopterygoid, not extending forwards as far as the palatine; poison-fangs rather short, followed, after a short interspace, by 7 or 8 solid teeth. Nostrils superior; snout long; head-shields large; nasals in contact with each other; a præocular; no loreal. Body rather short; scales hexagonal or squarish, juxtaposed; no distinct ventrals.” (*Boulenger.*)

Widely distributed throughout the Indian Ocean, Malay Archipelago, and the Pacific Ocean. Only one species is recognized.

### PELAMYDRUS PLATURUS (Linnæus)

#### PLATE 31, FIG. 1

*Anguis platura* LINNÆUS, Syst. Nat. ed. 12 1 (1766) 391.

*Hydrus bicolor* SCHNEIDER, Hist. Amph. 1 (1799) 242; CANTOR, Cat. Mal. Rept. (1847) 135; CUVIER, Reg. Anim. Rept. Atlas 6, pl. 36.

*Hydrophis platura* LATREILLE, Hist. Nat. Rept. 4 (1802) 197.

*Pelamis bicolor* DAUDIN, Hist. Nat. Rept. 7 (1803) 366; GRAY, Cat. Vip. Snakes (1849) 41; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1335; GÜNTHER, Rept. Brit. India (1864) 382; KREFFT, Snakes Austral. (1869) 98, pl. 12, fig. 19; STRAUCH, Schl. Russ. Rept. (1873) 199; FAYRER, Thanatoph. Ind. (1874) pl. 17; PETERS, Preuss. Exped. O. Asien 1 (1876) 382; PETERS and DORIA, Ann. Mus.

Genova 12 (1878) 416; MURRAY, Zool. Sind. (1883) 397; FISK, Proc. Zool. Soc. London (1885) 482; BOETTGER, Ber. Senck. Nat. Ges. (1886) 119; Zool. Anz. 11 (1888) 398 (Philippines); CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 443.

*Hydrophis pelamis* SCHLEGEL, Phys. Serp. 2 (1837) 508, Atlas, pl. 18, figs. 13-15; Fauna Jap., Rept. (1838) 90, pl. 8.

*Pelamis ornata* GRAY, Zool. Misc. (1842) 60; Cat. Vip. Snakes (1849) 43.

*Hydrophis bicolor* FISCHER, Abh. Naturw. Hamburg 3 (1856) 51; JAN, Icon. Ophid. (1872) livr. 40, pls. 2 and 3.

*Pelamis platurus* STOLICZKA, Proc. As. Soc. Bengal (1872) 92; GARMAN, Bull. Essex Inst. 24 (1892) 88.

*Hydrus platurus* BOULENGER, Fauna Brit. India, Rept. (1890) 397; Cat. Snakes Brit. Mus. 3 (1896) 267; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 439; BOETTGER, Ber. Offenb. Ver. Nat. (1892) 88.

*Pelamydrus platurus* STEJNEGER, Proc. U. S. Nat. Mus. 38 (1911) 111.

*Description of species.*—(From an unnumbered specimen in the Santo Tomás Museum, Manila; Manila Bay.) Head elongate, slender; rostral as high as wide, visible above; nostril superior, pierced in nasal in lower posterior corner; nasals longer than prefrontals, their mutual suture longer than that between prefrontals; no internasals; frontal about as long as distance to end of snout, narrow and pointed posteriorly, little

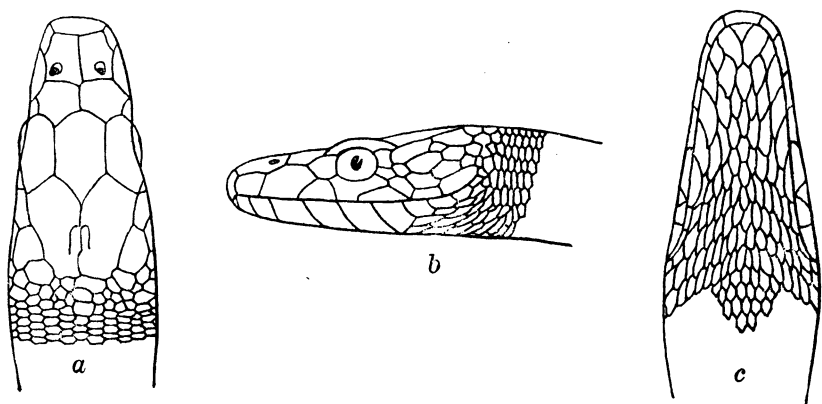


FIG. 28. *Pelamydrus platurus* (Linnæus); after Stejneger; a, head, dorsal view; b, head, lateral view; c, head, ventral view.

wider than supraoculars; parietals but little longer than frontal, with 2 small equal scales inserted between them and entirely surrounded by them; 8 upper labials, first square, second high, in contact with prefrontal and upper preocular, fourth entering eye; 2 preoculars; 2 large postoculars; temporals 3 + 3; mental very small; 11 and 12 lower labials, first large, broadly in contact; first pair of chin shields small, broken, touching 3 labials;

53 scale rows around body; scales hexagonal or quadragonal, juxtaposed; ventrals scarcely differentiated; 4 preanals; tail greatly flattened.

*Color in alcohol.*—The 23 dorsal scale rows on body and head are dark brown, the 30 lateral and ventral rows, yellowish; tail barred above with 6 bands of brown, which reach down about halfway on side of tail; below with 7 similar bands alternating; rest of tail yellowish.

*Measurements of Pelamydrus platurus (Linnæus).*

|                        | mm. |
|------------------------|-----|
| Total length           | 540 |
| Snout to vent          | 479 |
| Tail                   | 61  |
| Greatest width of tail | 15  |

*Variation.*—This species is extremely variable in color.

Boulenger \* recognizes seven color varieties; this specimen belongs to his variety E (*Hydrus bicolor* Schneider). The scales vary from 45 to 53 around the body; they are smooth in the young and in the females; in the males the laterals and ventrals are rough, with 1, 2, or 3 tubercles.

*Remarks.*—This species is rare in the Philippines; the specimen described is one of the first records for Luzon.

#### ELAPINÆ

Tail cylindrical; hypapophyses more or less developed throughout the vertebral column. Poison fangs well developed, standing erect and stationary. Deadly poisonous.

This group contains the most dangerous snakes, notably the genus *Naja* the species of which are generally known as cobra or *cobra di capello*. There are more than thirty genera of the Elapinæ. Most of the genera are confined to Australia and New Guinea, with their near-by islands. They constitute the greater part of the Australian snakes. One genus is confined to North, Central, and South America, and is the only genus of the family in that territory.

Three genera are known in the Philippines.

*Key to the Philippine genera of the Elapinæ.*

- a<sup>1</sup>. Vertebrae of neck with long ribs which enable the distension of neck; poison gland confined to head; scales in 15 to 25 rows around body; internasal borders nostril..... *Naja Laurenti* (p. 255).
- a<sup>2</sup>. No elongate ribs on cervical vertebrae; internasals not bordering nostril.
  - b<sup>1</sup>. Scales in 15 rows; poison gland confined to head.

*Hemibungarus* Peters (p. 268).

\* Catalogue, loc. cit.

- b<sup>1</sup>. Scales in 13 rows; poison gland very elongate, entering far into body cavity..... *Doliophis* Girard (p. 273).

### Genus *NAJA* Laurenti

*Naja* LAURENTI, Syn. Rept. (1768) 90; MERREM, Tent. Syst. Amph. (1820) 147; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1275; GÜNTHER, Cat. Col. Snakes (1858) 220; Rept. Brit. India (1864) 338; JAN, Elenco Sist. Ofid. (1863) 119; BOETTGER, Ber. Senck Nat. Ges. (1886) 116; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 439; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 394.

*Naja*, part., SCHLEGEL, Phys. Serp. 2 (1837) 461; BOIE, Isis (1827) 537.

*Dendraspis* FITZINGER, Syst. Rept. (1843) 28.

*Uræus* WAGLER, Syst. Amph. (1830) 173.

*Aspis* WAGLER, Syst. Amph. (1830) 173 (non Laurenti).

*Tomyris* EICHWALD, Zool. Spec. 3 (1831) 171.

*Hamadryas* (non Hübner) CANTOR, Asiat. Res. 19 (1836) 87; GÜNTHER, Cat. Col. Snakes (1858) 218.

*Trimeresurus*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1244.

*Pseudohaje* GÜNTHER, Cat. Col. Snakes (1858) 222.

*Ophiophagus* GÜNTHER, Rept. Brit. India (1864) 340; BOETTGER, Ber. Senck. Nat. Ges. (1886) 116; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 439.

*Naja* BOULENGER, Fauna Brit. India, Rept. (1890) 390; Cat. Snakes Brit. Mus. 3 (1896) 372.

"Maxillary extending beyond the palatine, with a pair of large grooved poison-fangs, and one to three small, faintly grooved teeth near its posterior extremity; mandibular teeth, anterior longest. Head not or but slightly distinct from neck; eye moderate or rather large, with round pupil; nostril between two nasals and the internasal; no loreal. Body cylindrical; scales smooth, without pits, disposed obliquely, in 15-25 rows (or more on the neck); ventrals rounded. Tail moderate; subcaudals all or greater part in two rows." (*Boulenger.*)

The genus *Naja* is distributed from Africa, over southern Asia and the Malay Archipelago. One species extends into Celebes. The larger part of the species is African. Two well-known and widely distributed species enter the Philippines.

#### Key to the Philippine species of *Naja* Laurenti.

- a<sup>1</sup>. Scales in 19 to 21 rows on neck, 15 rows on body; 4 meters in length  
N. hannah (Cantor) (p. 256).  
a<sup>2</sup>. Scales in 21 to 35 rows on neck, 17 to 25 rows on body; 2 meters in  
length or less..... N. naja Linnæus (p. 259).

The second species is represented in the Philippines by three well-defined subspecies which, as Boulenger \* states, "might be regarded as distinct species but for the absence of any sharp demarcation-lines between them."

\* Catalogue, 381.

The cobra, or *cobra di capello* (Portuguese), which is the common name for this group of snakes associated under the species *Naja naja*, is readily recognized by its habit of raising the anterior part of the body from the ground, and spreading the skin of the neck, when disturbed. The vertebræ of the neck are equipped with elongate ribs. Usually, too, the snake emits a loud hissing noise when it strikes, and not infrequently squirts small jets of venom from its hollow fangs. This poison can be thrown at least 2 meters, but cannot do harm unless thrown into a fresh wound or into the eye. The eye thus poisoned becomes inflamed and a conjunctivitis results, sometimes causing blindness and even death. In *Naja hannah* the ability to spread the neck is probably much less developed than in *N. naja*. The food of the two species consists of snakes, lizards, and frogs. *N. hannah* appears to prey wholly on snakes of other species. Snakes of this genus are deadly poisonous to man, death usually ensuing a few hours after the individual is bitten.

#### NAJA HANNAH (Cantor)

##### PLATE 31, FIGS. 2 AND 3

- Hamadryas hannah* CANTOR, As. Res. 19 (1836) 87, pls. 10-12.  
*Naja bungarus* SCHLEGEL, Phys. Serp. 2 (1837) 476, pl. 17, figs. 8, 9;  
 SCHLEGEL and MÜLLER, in Temminck Verh. Overz. Bez. Nederl. Ind. Rept. (1844) 71, pl. 10; PETERS, Mon. Berl. Ak. (1861) 690; BOULENGER, Fauna Brit. India, Rept. (1890) 392, fig. 114; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 266.  
*Hamadryas ophiophagus* CANTOR, Proc. Zool. Soc. (1839) 32; Cat. Mal. Rept. (1847) 116.  
*Trimeresurus ophiophagus*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1245.  
*Hamadryas elaps* GÜNTHER, Cat. Col. Snakes (1858) 219.  
*Trimeresurus bungarus* JAN, Rev. and Mag. Zool. (1859) 129; Icon. Gén. (1873) 44, pl. 4.  
*Naja* (*Hamadryas* ?) *fasciata* PETERS, Mon. Berl. Ak. (1861) 689.  
*Ophiophagus elaps* GÜNTHER, Rept. Brit. India (1864) 341; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 210, pl. 11, fig. 7; ANDERSON, Proc. Zool. Soc. (1871) 188; FAYRER, Thanatoph. Ind. (1874) pls. 7, 8; BOETTGER, Ber. Senck. Nat. Ges. (1886) 116; Ber. Offenb. Ver. Nat. (1888) 86; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 440.  
*Naja elaps* THEOBALD, Cat. Rept. Brit. India (1876) 209.  
*Naja ingens* VAN HASSELT, Versl. Ak. Amsterd. 17 (1882) 140.  
*Ophiophagus fasciatus* BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 439.  
*Hamadryas elaps* FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81.  
*Naja tripudians* var. *sumatrana* MÜLLER, Verh. Nat. Ges. Basel 8 (1887) 277.  
*Naia bungarus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 386.

*Description of species.*—(From No. 13, Bureau of Science collection; collected at Iwahig, Palawan, 1917, by C. M. Weber.) (Adult male.) Rostral barely visible from above, one and one-

fifth times as wide as high; suture between internasals about half the length of scales; prefrontals larger than internasals, wider than long, drawn to a point laterally which nearly separates preocular from nasal; frontal about one-fifth longer than wide, as wide as but slightly narrower than supraoculars, equal to its distance from rostral; parietals very long, equal to their distance from rostral, bordered by 2 large temporals and 2 large postparietals; nostril between 2 nasals and internasal; a small square preocular; 3 postoculars; temporals 2 + 3; 7 upper labials, fifth nearly as high as fourth; 8 lower labials; anterior chin shields wider but shorter than posterior, which are not separated from each other; scales in 15 smooth rows about body, 21 rows about neck; ventrals 267; subcaudals 104 (8 undivided); anal single; length of eye contained in distance from eye to snout one and seven-tenths times.

*Color in alcohol.*—Yellowish to olive brown above, the scales of posterior part of body edged with brown, growing darker and more pronounced on tail. Body traversed by a number of dim lighter bars, at least seventy, scarcely apparent on anterior part of body or tail; this coloration is due chiefly to the coloring of the skin between scales.

*Measurements of Naja hannah (Cantor).*

|                | mm.   |
|----------------|-------|
| Total length   | 2,315 |
| Snout to vent  | 1,853 |
| Tail           | 462   |
| Length of head | 45    |
| Width of head  | 22    |

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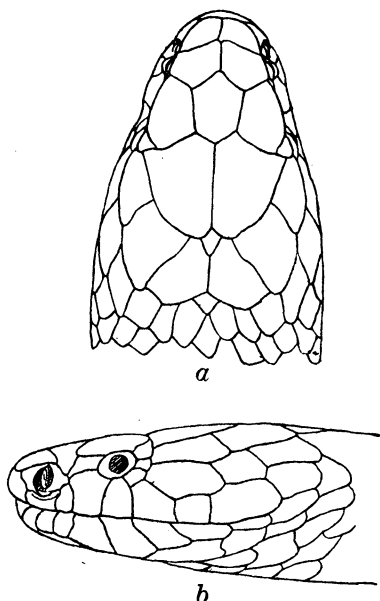


FIG. 29. *Naja hannah* (Cantor); after Boulenger; a, head, dorsal view; b, head, lateral view

*Variation.*—Three islands are represented in the collection, and the following differences in scale formulæ are noted. These formulæ are compiled as averages from the table: Palawan, four specimens,  $\frac{19-21}{15}$ ; 262; 103; Mindoro, two specimens,  $\frac{17-19}{15}$ ; 248.5, 108; Luzon (Baguio), two specimens,  $\frac{19}{15}$ ; 250.5; 92.5.

The Palawan forms have a larger number of ventral scales than do those from the other two islands. I doubt whether these averages would be maintained with large series. The total averages of ventrals and of subcaudals of the eight specimens are 256 and 101, respectively. Of the specimens listed by Boulenger the averages are: Ventrals, 249; subcaudals, 101. Thus it appears that the Philippine specimens have a slightly higher average of scales. Boulenger lists four color varieties, but these may be largely due to the various ages of the specimens. The young are always more vividly marked than the adults. Peter's *Ophiophagus fasciatus* is probably founded on a young specimen. The number of undivided subcaudals varies; the specimens have a range of from 7 to 41, the one with the highest count being a

TABLE 54.—Measurements and scale counts of *Naja hannah* (Cantor).

| No. | Locality. |       | Collector.                   |       | Sex. | Length. | Tail. | Ventrals. |
|-----|-----------|-------|------------------------------|-------|------|---------|-------|-----------|
|     |           |       |                              |       |      | mm.     | mm.   |           |
| 727 | Mindoro   | ----- | C. Burks                     | ----- | ♂    | 1,610   | 345   | 251       |
| 12  | Palawan   | ----- | M. Ramos                     | ----- | ♀    | 2,378   | 475   | 266       |
| 13  | do        | ----- | C. M. Weber                  | ----- | ♂    | 2,315   | 462   | 267       |
| 14  | Baguio    | ----- | -----                        | ----- | ♂    | 2,270   | 475   | 249       |
| 15  | Palawan   | ----- | C. H. Lamb                   | ----- | ♂    | 1,955   | 465   | 251       |
| 16  | do        | ----- | do                           | ----- | ♀    | 2,726   | 530   | 264       |
| 17  | Mindoro   | ----- | Marine Biological Expedition | ----- | ♂    | 2,442   | 530   | 246       |
| 18  | Baguio    | ----- | L. E. Griffin                | ----- | ♂    | 2,620   | 540   | 252       |

| No. | Sub-caudals. | Labials. |        | Scale rows. |       | Undivided sub-caudals. | Postoculars. | Collection.        |
|-----|--------------|----------|--------|-------------|-------|------------------------|--------------|--------------------|
|     |              | Upper.   | Lower. | Neck.       | Body. |                        |              |                    |
| 727 | 112          | 7        | 8      | 19          | 15    | 41                     | 3-4          | E. H. Taylor.      |
| 12  | 104          | 7        | 8      | 19          | 15    | -----                  | 3            | Bureau of Science. |
| 13  | 104          | 7        | 8      | 21          | 15    | 8                      | 3            | Do.                |
| 14  | 90           | a 7-5    | 8      | 19          | 15    | 10                     | 3            | Do.                |
| 15  | 102          | 7        | 8      | 19          | 15    | 11                     | 3            | Do.                |
| 16  | 101          | 7        | 8      | 19          | 15    | 8                      | 3            | Do.                |
| 17  | 104          | 7        | 8      | 17          | 15    | 11                     | 3            | Do.                |
| 18  | 95           | 7        | 8      | 19          | 15    | 33                     | 3            | Do.                |

<sup>a</sup> Abnormal.

medium-sized specimen from Mindoro; this same specimen has 4 postoculars on the right side.

The variation in color and markings is small, save that the narrow transverse bars are very dim or wanting in older specimens, and the color edging the scales on the tail is quite black.

*Remarks.*—This snake grows to a large size in the Islands. A specimen collected in Balabac by Mr. C. M. Weber measured 4.25 meters, which I believe is the largest recorded specimen. Unfortunately its large bulk caused it to rot in the preserving fluid. It is reported as being very common on Lubang Island, north of Mindoro. I have not been able to verify this report. It probably occurs on all the larger islands. It is striking, however, that I find no specimens recorded from the western Visayan islands (Bohol, Cebu, Negros, and Panay). In fact, no cobras of any sort have yet been recorded from those islands.

#### NAJA NAJA Linnæus

The assemblage of subspecies now associated under this specific name is so large that I have not attempted to give a synonymic list of them. Synonymies for Philippine forms are given in the treatment of the individual subspecies.

##### *Key to the Philippine subspecies of Naja naja Linnæus.*

- a*<sup>1</sup>. Scale rows on neck, 19 to 21; on body, 17 to 19; ventrals, 165 to 178; subcaudals, 42 to 46. Black above with yellow reticulations or yellow dots; a few yellow anterior ventrals, behind which ventrals are dense black..... *N. n. samarensis* Peters (p. 259).
- a*<sup>2</sup>. Scale rows on neck, 21 to 23; on body, 19; ventrals, 178 to 186; subcaudals, 46 to 51. Black above and below with a yellowish V-shaped mark; young dense black with few whitish bars.  
*N. n. miolepis* (Boulenger) (p. 262).
- a*<sup>3</sup>. Scale rows on neck, 25; on body, 21 to 23; ventrals, 187 to 196; subcaudals, 39 to 47; uniform olive or olive brown; young, yellowish olive with darker reticulations..... *N. n. philippinensis* subsp. nov. (p. 265).

#### NAJA NAJA SAMARENSIS Peters

*Naja tripudians* var. *F.*, part., GÜNTHER, Cat. Col. Snakes (1858) 225.

*Naja tripudians* var. *samarensis* PETERS, Mon. Berl. Ak. (1861) 690; BOETTGER, Ber. Senck. Nat. Ges. (1886) 116.

*Naja tripudians* GÜNTHER, Proc. Zool. Soc. London (1879) 78; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81.

*Naia samarensis* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 385.

*Naja samarensis* GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 266.

*Description of species.*—(From No. 427, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, June 25, 1913, by E. H. Taylor.) Rostral one and two-fifths to one and three-

fifths times as wide as high, the portion visible from above about one-fourth distance from frontal, sharply pointed behind, the sutures with nasals and labials subequal; the suture between internasals much shorter than the length of the scales; prefrontals a little broader than long, as long as or a little longer than internasals; the suture between them equal to the length of the scales; frontal one-sixth longer than wide, wider than supraocular but not quite so long, its length equal to its distance from rostral; parietals large, longer than wide, followed by a series of somewhat enlarged occipital shields bordering parietals and temporals; 2 nasals, posterior highest, appearing very narrow in a lateral view; from an anterior view it appears larger than anterior; 1 preocular reaching down to near middle of eye; 3 postoculars, third well below eye; temporals 2 + 2; 7 upper labials, third highest, reaching height of middle of eye, third and fourth entering orbit, first 2 smallest; 8 lower labials, fourth and fifth largest, 4 touching first pair of chin shields; anterior chin shields much larger than posterior, which are separated from each other; ventrals, 165; anal single; subcaudals, 46; scales smooth in 19 rows around neck, 17 rows around body; eye moderately large, about half as long as snout.

*Color in life.*—Above a dark, slightly iridescent, brownish black, with an indistinct yellowish netting, more prominent on posterior part of body; only a part of skin between scales yellowish; top of head olive-brown, sides of head and neck lighter, with a dim lighter line extending some distance along sides; lower part of upper labials, lower labials, chin, and first ten ventrals yellowish; eleventh to sixty-sixth ventrals black at first, but growing lighter toward end; ventrals behind these are yellowish, mottled with darker blotches; a median darker line below tail.

*Measurements of Naja naja samarensis Peters.*

|                | mm. |
|----------------|-----|
| Total length   | 870 |
| Snout to vent  | 725 |
| Tail           | 145 |
| Length of head | 35  |
| Width of head  | 21  |

*Variation.*—The six specimens in my collection from Mindanao, do not vary greatly among themselves in scalation. The amount and intensity of the dark coloring on the belly varies somewhat. All the specimens have the first few ventrals (usually nine) yellowish, although the color may cover only the first seven; after these the ventrals are an intense black, which color may continue back a third or more the length of body, growing gradually less

intense and lighter. In the young the black may cover as few as fifteen ventrals; also in the young the lighter line beginning on the hood appears more prominent. In all the specimens there is a small, lower labial inserted between the upper part of third and fourth lower labials bordering mouth; in the specimen described it is absent on one side. One specimen in the Bureau of Science, collected in Samar, has much more yellow on body; it is distributed in roundish spots on all the scales, the color rarely covering the entire scale, but frequently spots on two or three scales are confluent; the lateral light line is distinct in this adult specimen, and it has nineteen rows of scales around the body. The variation \* in counts of scale rows on neck and body, and of ventrals and subcaudals, may be represented by the following formula:  $\frac{19-23}{17-19}$ ; 165 to 178; 42 to 50. Two specimens have two undivided subcaudals; there is some variation in the relative width and height of the rostral.

TABLE 55.—Measurements and scale counts of *Naja naja samarensis* Peters.

| No.  | Locality.         | Collector.   | Sex or age. | Length. |
|------|-------------------|--------------|-------------|---------|
|      |                   |              |             | mm.     |
| 23   | Bunawan, Agusan   | E. H. Taylor | yg          | 278     |
| 24   | do                | do           | ♀           | (a)     |
| 25   | do                | do           | ♀           | 810     |
| 26   | do                | do           | ♂           | 870     |
| 27   | do                | do           | ♂           | 900     |
| 28   | do                | do           | yg          | 339     |
| R 20 | Catbalogan, Samar | G. I. Cullen | ♀           | 1009    |

| No.  | Tail. | Ventrals. | Subcaudals. | Upper labials. | Lower labials. | Scale rows. |       | Collection.        |
|------|-------|-----------|-------------|----------------|----------------|-------------|-------|--------------------|
|      | mm.   |           |             |                |                | Body.       | Neck. |                    |
| 23   | 45    | 172       | 44          | 7              | 8              | 17          | 19    | E. H. Taylor.      |
| 24   | 135   | 172       | 46          | 7              | 8              | 17          | 21    | Do.                |
| 25   | 121   | 178       | 42          | 7              | 8              | 17          | 21    | Do.                |
| 26   | 145   | 165       | 46          | 7              | 8              | 17          | 19    | Do.                |
| 27   | 145   | 172       | 45          | 7              | 8              | 17          | 19    | Do.                |
| 28   | 55    | 173       | 44          | 7              | 8              | 17          | 19    | Do.                |
| R 20 | 156   | 175       | 43          | 7              | 8-9            | 19          | 21    | Bureau of Science. |

<sup>a</sup> Mutilated.

I do not believe that the differences here recorded warrant giving this form specific designation while the other two forms,

\* Combining the data recorded in the table with those in Boulenger's Catalogue, op. cit. 385.

*Naja naja miolepis* and *Naja naja philippinensis*, are regarded only as varieties, as Boulenger has treated them. It is certain that all three should be regarded as distinct species if only Philippine material were to be considered, as two of the forms, *miolepis* and *samarensis*, appear to be isolated here, geographically, while the third invades the restricted territories of the other two. There appears to be no intergrading of any sort.

*Remarks.*—This cobra is probably confined to the eastern Visayan islands (Samar and Leyte) and Mindanao. It is common in the Agusan Valley. The specimens in my collections were found crawling in daytime in the forest or on the lawn about my house. When discovered they made no effort to escape, but usually stopped quiet; if disturbed they immediately raised their heads and spread their hoods. I did not observe them eject poison from their fangs, as is true of *Naja naja philippinensis*.

A specimen from Zamboanga kept alive in the Bureau of Science has a very intrepid disposition and is disposed to put itself on the defensive at the approach of anything. It readily takes living frogs and snakes (*Calamaria gervaisii*) for food. Snakes, lizards, and frogs probably form its food under natural conditions. The snake is deadly poisonous. Two large Berkshire pigs kept on an agricultural farm at Bunawan succumbed to bites of these snakes within a period of a few hours after being bitten. Among the Manobos the snake is called *aguason* and is greatly feared. Several harmless snakes are also classed as *aguason* because of similarity in color.

#### NAJA NAJA MIOLEPIS (Boulenger)

##### PLATE 32

*Naia tripudians* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 84.

*Naia tripudians* var. *miolepis* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 384.

*Naja naja miolepis* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600; § D 6 (1911) 266; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 136.

*Description of species.*—(From No. 3, Bureau of Science collection; collected at Iwahig, Palawan, 1908, by C. M. Weber.) Rostral one and one-fifth times as wide as high, visible above, the part visible triangular; internasals about as large as prefrontals, their greatest length along prefrontal suture, their mutual suture less than half their length, narrowly in contact with preocular; prefrontals wider than long, shorter than internasals; frontal one and one-fifth times as long as broad, and one and a half times as wide as supraoculars, but equal in length,

slightly shorter than its distance to end of snout; parietals much longer than wide; nostril vertical, between 2 nasals; a single small preocular; 3 postoculars (2 on left side); 2 anterior temporals, the lower nearly as large as parietals, narrowly separated from mouth; 3 posterior temporals; the scales bordering parietals and temporals slightly enlarged; 7 upper labials, third and fourth entering eye, third not reaching the height of middle of eye;

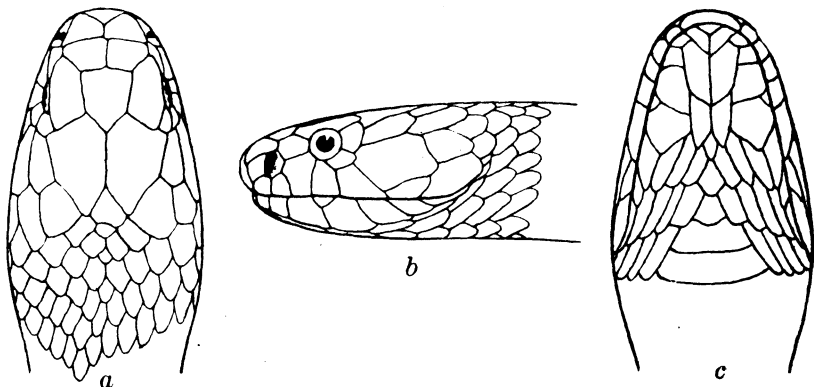


FIG. 30. *Naja naja miolepis* (Boulenger); a, head, dorsal view; b, head, lateral view; c, chin;  $\times 1$ .

labials in the following order of size: seventh, fifth, third, fourth, sixth, first, and second; 8 lower labials, with a small scale inserted between fourth and fifth bordering mouth (always present); anterior chin shields longer and wider than posterior, which are not separated; 4 labials touching first pair of chin shields; scales smooth in 23 rows on neck, 19 around body; ventrals, 182; subcaudals, 46; anal single.

*Color in alcohol.*—Bluish to brownish black on body dorsally, and laterally slightly lighter below; the skin between the scales lighter; on latter half of body several dim, V-shaped, lighter bands cross body at distant intervals; head olive-brown, side of head and chin yellowish. A yellowish brown band on side of neck crossing anterior part.

*Measurements of Naja naja miolepis (Boulenger).*

|                | mm.   |
|----------------|-------|
| Total length   | 1,227 |
| Snout to vent  | 1,050 |
| Tail           | 177   |
| Length of head | 36    |
| Width of head  | 23    |

*Variation.*—The young are deep black with a series of about 12 yellowish bands about body continuing to tip of tail; these

are darker on belly, but are usually distinct; the anterior ones are V-shaped on back; first 12 ventrals yellow; head yellow-brown, with a dark area on frontal and parietals. Four of the six specimens studied have only 2 preoculars on the left side and 3 on the right; one specimen has this reversed, and the other has the same number on each side. The average counts of scale rows on neck and body, of ventral and subcaudal scales, may be expressed in the following formula:  $\frac{21-23}{19}$ ; 178 to 186; 46 to 51. This, com-

bined with the recorded counts of Boulenger,\* gives  $\frac{21-23}{17-19}$ ; 178 to 199; 45 to 51. The Borneo specimens have 17 scale rows on body, while the Palawan forms have 19. There is a slightly higher average of ventrals in the Borneo forms.

TABLE 56.—Measurements and scale counts of *Naja naja miolepis* (Boulenger).

| No. | Locality.    | Collector.       | Sex or age. | Length. | Tail. | Ventrals. |
|-----|--------------|------------------|-------------|---------|-------|-----------|
|     |              |                  |             | mm.     | mm.   |           |
| 1   | Palawan..... | C. M. Weber..... | ♂           | 1,180   | 181   | 180       |
| 2   | do.....      | do.....          | ♂           | 1,075   | 160   | 184       |
| 3   | do.....      | do.....          | ♂           | 1,227   | 177   | 182       |
| 4   | do.....      | do.....          | yg          | 750     | 116   | 186       |
| 5   | do.....      | do.....          | yg          |         | 60    | 178       |
| 6   | do.....      | do.....          | yg          | 345     | 55    | 186       |

| No. | Sub-caudals. | Labials. |        | Scale rows. |       | Post-oculars. | Collection.        |
|-----|--------------|----------|--------|-------------|-------|---------------|--------------------|
|     |              | Upper.   | Lower. | Neck.       | Body. |               |                    |
| 1   | 51           | 7        | 9      | 23          | 19    | 2-3           | Bureau of Science. |
| 2   | 48           | 7-8      | 9      | 21          | 19    | 2-3           | Do.                |
| 3   | 46           | 7        | 9      | 23          | 19    | 2-3           | Do.                |
| 4   | 47           | 7-8      | 8-9    | 23          | 19    | 2-3           | Do.                |
| 5   | 50           | 7        | 9      | 23          | 19    | 3             | Do.                |
| 6   | 49           | 7        | 9      | 23          | 19    | 2-3           | Do.                |

*Remarks.*—This subspecies appears to be confined to Borneo and Palawan, and probably the other islands of the Palawan group. It is easily distinguishable from the other Philippine forms by the white markings on the young, and the dark uniform color of the adults. Griffin † states that the species is common in Palawan.

\* Op. cit. 384-385.

† Philip. Journ. Sci. § A 4 (1909) 600.

## NAJA NAJA PHILIPPINENSIS subsp. nov.

*Naia tripudians cæca*, part., BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 383 (spec. o, highlands of Lepanto, N. Luzon).

*Naja naja cæca* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600; § D 6 (1911) 266.

*Description of species*.—(From No. 7, Bureau of Science collection; collected in Manila, by C. Canonizado.) (Adult female.) Rostral one and three-fifths times as long as broad, the portion visible above less than one-fourth its distance from frontal; internasals about same size as prefrontals, in contact with preocular, the suture between them about half the length of the scales; prefrontals as wide as long, their shortest sides bordering frontal; latter one and one-fifth times as long as wide, its length equal to its distance from rostral, a little wider, but shorter, than supraocular; parietals longer than wide; nostril between 2 nasals and internasal; a preocular present; 3 postoculars; temporals  $2 + 2$ ; 7 upper labials, third and fourth entering eye, third highest, not reaching level of middle of eye; 8 lower labials (counting a small scale inserted between fourth and fifth labials); anterior chin shields largest, touching 4 lower labials; posterior chin shields separated from each other; ventrals, 190; subcaudals, 43; anal single; scales smooth, in 21 rows about body; 25 rows around neck; eye more than half the length of snout.

*Color in life*.—Above yellowish to olive-brown, becoming slightly lighter on outer scale rows; below immaculate yellowish white to cream; no markings of any sort evident.

*Measurements of Naja naja philippinensis subsp. nov.*

|               | mm.   |
|---------------|-------|
| Total length  | 1,000 |
| Snout to vent | 860   |
| Tail          | 140   |

*Variation*.—The young of this subspecies are dark brown to black, reticulated with a heavy network of light olive-yellow in distinct contrast; the head has a suggestion of darker markings; the neck is lighter, with irregular series of small round or longitudinal spots on each side; below, the belly is of a dirty light olive. The scales behind parietals are usually more or less enlarged.

The variation of the scale counts is expressed in the following formula: neck and body rows,  $\frac{23-25}{21-23}$ ; ventrals, 177 to 191; sub-

caudals, 39 to 49. The average count is as follows:  $\frac{25}{21}$ , 176, 44.

Specimens Nos. 463 to 470 recorded in the table were hatched from eggs laid in the laboratory by specimen No. 481. The varia-

tions which obtain in this brood are striking; they are expressed by the following formula:  $\frac{23-25}{21}$ , 177 to 191, 41 to 48; or an average ventral and subcaudal count of 184 and 44, respectively. The scale formula of the mother is  $\frac{23}{21}$ , 191, 39. Three of the young have the posterior chin shields in contact.

*Remarks.*—The common Luzon cobra cannot be classed with either *Naja naja cæca*, as Griffin and Boulenger have done, or *N. naja sputatrix*, on the basis of either color or scale formula.

The average scale counts given by Boulenger for *N. naja cæca* (exclusive of the two Javanese specimens and a specimen from Luzon) are:  $\frac{27}{23}$ , 193, 66; *N. naja sputatrix*  $\frac{25}{20}$ , 176, 47. *Naja naja philippinensis* approaches *N. naja cæca* in color, but varies markedly in the scale formula; it approaches *N. naja sputatrix* in the scale formula, but varies markedly in color and markings. Several of these snakes are kept at the Bureau of Science for the purpose of extracting the venom from them for use in the manufacture of antivenom serums.

In captivity some specimens take frogs and small snakes readily for food; others refuse all food, starving themselves to death. One female laid twelve eggs in the vivarium. These were removed and buried in moist earth. After a period of incubation of seven weeks the young emerged. The young snake on breaking the egg, stuck out its head and by various movements made a burrow to the surface without emerging wholly from the egg. Thus with the body still in the egg and the head at the surface of the ground, it would remain for hours at a time unless disturbed, at which times it would withdraw wholly within the egg which still contained much liquor. On removing an egg and its living contents from under the ground and placing it on the surface, the young cobra would partially emerge and, with body erect for a length of several centimeters and hood distended, would hiss and strike at any object held near it. The young snakes did not leave the eggs voluntarily until after three or four days. When this was done they immediately took refuge in a small jar of water placed in the cage, their bodies wrapped together in the water in a mass and their snouts above the surface. Here they were to be found for a period of from eight to ten days, when they left the water and took refuge under small objects where they began the process of shedding. They touched no food during these early days of their life but did so as soon as the shedding was completed.

TABLE 57.—Measurements and scale counts of *Naja naja philippinensis* subsp. nov.

| No. | Locality.                  | Collector.                  | Age or sex. | Length. | Tail. |
|-----|----------------------------|-----------------------------|-------------|---------|-------|
|     |                            |                             |             | mm.     | mm.   |
| 481 | Pampanga, Luzon.....       | Guerrero .....              | ♀           | 1,115   | 132   |
| 463 | Hatched in laboratory..... |                             | yg          | 345     | 47    |
| 464 | .....do.....               |                             | yg          | 345     | 50    |
| 465 | .....do.....               |                             | yg          | 364     | 56    |
| 466 | .....do.....               |                             | yg          | 325     | 42    |
| 467 | .....do.....               |                             | yg          | 351     | 48    |
| 468 | .....do.....               |                             | yg          | 311     | 40    |
| 469 | .....do.....               |                             | yg          | 320     | 41    |
| 470 | .....do.....               |                             | yg          | 340     | 45    |
| 482 | Pampanga, Luzon.....       | Guerrero .....              | ♂           | 1,120   | 143   |
| 483 | .....do.....               | .....do.....                | ♂           | 850     | 110   |
| 484 | .....do.....               | .....do.....                | ♂           | 1,145   | 150   |
|     | .....do.....               | .....do.....                | ♂           | 1,290   | 170   |
|     | .....do.....               | .....do.....                | ♂           | 1,455   | 195   |
| 7   | Manila.....                | C. Canonizado.....          | ♀           | 1,000   | 140   |
| 8   | Pampanga, Luzon.....       | L. I. Williams.....         | yg          | 345     | 50    |
| 9   | Palawan.....               | C. M. Weber.....            | ♀           | 840     | 118   |
| 10  | Manila.....                | W. Schultze.....            | ♀           | 990     | 125   |
|     |                            |                             |             | 1,200   | 160   |
|     | Los Baños, Laguna.....     | College of Agriculture..... |             |         |       |
|     | .....do.....               | .....do.....                |             |         |       |

| No. | Ventrals. | Subcaudals. | Labials. |        | 2d chin shields separated. | Scale rows. |       | Collection.             |
|-----|-----------|-------------|----------|--------|----------------------------|-------------|-------|-------------------------|
|     |           |             | Upper.   | Lower. |                            | Neck.       | Body. |                         |
| 481 | 191       | 39          | 7        | 9      | Yes                        | 23          | 21    | Bureau of Science.      |
| 463 | 180       | 43          | 7        | 8      | No                         | 23          | 21    | Do.                     |
| 464 | 177       | 48          | 7        | 9      | No                         | 25          | 21    | Do.                     |
| 465 | 183       | 44          | 7        | 9      | No                         | 23          | 21    | Do.                     |
| 466 | 190       | 43          | 7        | 8      | Yes                        | 23          | 21    | Do.                     |
| 467 | 190       | 45          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 468 | 181       | 45          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 469 | 191       | 41          | 7        | 9      | Yes                        | 23          | 21    | Do.                     |
| 470 | 183       | 44          | 7        | 9      | No                         | 23          | 21    | Do.                     |
| 482 | 183       | 40          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 483 | 188       | 41          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 484 | 189       | 41          | 7        | 9      | Yes                        | 23          | 21    | Do.                     |
|     | 183       | 43          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
|     | 191       | 46          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 7   | 190       | 43          | 7        | 8      | Yes                        | 25          | 21    | Do.                     |
| 8   | 190       | 47          | 7        | 9      | Yes                        | 25          | 23    | Do.                     |
| 9   | 190       | 47          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
| 10  | 188       | 39          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
|     | 188       | 47          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
|     | 184       | 49          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |
|     | 187       | 40          | 7        | 9      | Yes                        | 25          | 21    | College of Agriculture. |
|     | 186       | 40          | 7        | 9      | Yes                        | 25          | 21    | Do.                     |

They were fed tadpoles or young frogs, which they would seize and hold some time, and then begin the process of swallowing. They frequently bit each other, and on two occasions one was found engaged in swallowing one of its brothers; one was withdrawn that had been half swallowed, and it recovered. The young lived for about two months when an epidemic appeared among them and all died.

A young specimen, five days old, bit a guinea pig, which succumbed in twenty-two minutes. These snakes are poisonous, and probably cause more deaths than any other snake in the Philippines.

The subspecies is found very commonly in Luzon, and it occurs in Palawan and probably in other large islands.

### Genus *HEMIBUNGARUS* Peters

*Elaps*, part., DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1191; GÜNTHER, Cat. Col. Snakes (1858) 229; JAN, Rev. and Mag. Zool. (1858) 516.

*Brachyrhynchus* FITZINGER, Syst. Rept. (1843) 28.

*Callophis*, part., GÜNTHER, Proc. Zool. Soc. London (1859) 81.

*Hemibungarus* PETERS, Mon. Berl. Ak. (1862) 637; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 392; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 440; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 387.

"Maxillary bone extending forwards beyond the palatine, with a pair of large grooved poison-fangs and one to three small solid teeth; mandibular teeth subequal. Præfrontal bones in contact with each other on the median line. Head small, not distinct from neck; eye small, with round pupil; nostril between two nasals; no loreal. Body cylindrical, much elongate; scales smooth, without pits, in 13 or 15 rows; ventrals rounded. Tail short; subcaudals in two rows." (*Boulenger.*)

#### *Key to the Philippine species of Hemibungarus Peters.*

a<sup>1</sup>. Temporals 2 + 3; 6 upper labials.

b<sup>1</sup>. Second labial not touching preocular.

*H. calligaster* (Wiegmann) (p. 269).

b<sup>2</sup>. Second labial touching preocular..... *H. meelungi* sp. nov. (p. 272).

a<sup>2</sup>. No temporals; 7 upper labials, sixth forming a suture with parietal.

*H. collaris* (Schlegel) (p. 269).

The genus *Hemibungarus* is a small, compact one, with few species. The three species given in the key are confined to the Philippines. Another species, *H. nigrescens*, is found in India, and two others, *H. japonicus* and *H. boettgeri*, are found on nearby archipelagoes to the north. The snakes are poisonous. They

appear to be rather rare in the Philippines. The name *oro-odto* (Bohol-Visayan) is applied to this snake. It is probable that the names *camamalo* and *palapal* are also referable to this species.

#### HEMIBUNGARUS COLLARIS (Schlegel)

- Elaps collaris* SCHLEGEL, Phys. Serp. 2 (1837) 448; Abbild. (1844) 137, pl. 46, figs. 10-11; JAN, Elenco Sist. Ofid. (1863) 114; Icon. Gén. (1873) 43, pl. 1, fig. 1.  
*Elaps gastrodelus* DUMÉRIL and BIBRON, Erp. Gén. 2 (1854) 1212.  
*Hemibungarus collaris* BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 393; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 440; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 266.

*Description of species.*—(From Boulenger.) “Rostral broader than deep, just visible from above; internasals shorter than the præfrontals; frontal once and a half as long as broad, as long as its distance from the rostral, as long as the parietals; one præ- and two postoculars; seven upper labials, third and fourth entering the eye, sixth largest and forming a suture with the parietal; anterior chin-shields in contact with the symphysial and with four lower labials; posterior chin-shields as long as the anterior. Scales in 15 rows. Ventrals 228-230; anal divided; subcaudals 12-22. Blackish above, barred black and red below; a yellowish occipital collar.”

#### *Measurements of Hemibungarus collaris (Schlegel).*

|               | mm. |
|---------------|-----|
| Total length  | 430 |
| Snout to vent | 415 |
| Tail          | 15  |

*Remarks.*—I have seen no specimen of this snake. Obviously it is very rare, and none appears to have been taken in recent years. The only definite locality known is Manila, recorded by Jan. Only a few specimens are known. The species is deadly poisonous.

#### HEMIBUNGARUS CALLIGASTER (Wiegmann)

PLATE 33, FIGS. 1 AND 2; PLATE 34, FIGS. 1 AND 2

- Elaps calligaster* WIEGMANN, Nova Acta Acad. Leop.-Carol. I 17 (1835) 253, pl. 20, fig. 2; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1226; GÜNTHER, Cat. Col. Snakes (1858) 231; JAN, Icon. Gén. (1873) 43, pl. 2, fig. 2; Rev. & Mag. Zool. (1859) 510; PETERS, Mon. Berl. Ak. (1861) 689.  
*Callophis calligaster* GÜNTHER, Proc. Zool. Soc. London (1859) 83.  
*Hemibungarus calligaster* MEYER, Mon. Berl. Ak. (1869) 213; MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 18; FISCHER,

Jahrb. wiss. Anst. Hamburg 2 (1885) 81; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 393; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 440; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 266.

*Hemibungarus gemianulis* PETERS, Mon. Berl. Ak. (1872) 587.

*Callophis gemianulus* MÜLLER, Verh. Nat. Ges. Basel 7 (1883) 289.

*Hemibungarus gemmiannulis* BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 441.

*Description of species.*—(From No. 231, E. H. Taylor collection; collected at Iloilo, Panay, 1914, by Archie L. Howard.) Head not distinct from neck; rostral a little broader than deep, narrowly visible above, forming its broadest suture with nasal; internasals broader than deep, the suture between them about half their width, bordering upper edge of nostril; prefrontals broader than deep, the left forming a short suture with right internasal, forming equal sutures with posterior nasal and upper preocular; frontal nearly twice as long as wide, wider and longer than supraoculars, longer than its distance from end of snout; parietals much longer than frontal, nearly twice as long as wide, touching upper postocular and 3 temporals; 2 nasals, anterior twice as large as posterior, almost surrounding nostril; no loreal\*; 2 preoculars, upper much the larger; eye small, not wider than its distance from mouth; 2 postoculars, lower largest, temporals 2 + 2 + 2, upper anterior touching both postoculars; 6 upper labials in the following order of size: fifth, sixth, third, fourth, second, first; third and fourth entering eye; 7 lower labials, first 4 in contact with anterior chin shields which are twice as large as posterior pair; body scales in 15 longitudinal rows, smooth, without apical pits, outer rows largest; ventrals, 197; anal very wide, single; subcaudals, 20 pairs; body cylindrical, tail short and thick, ending in a rather sharp-pointed scute.

*Measurements of Hemibungarus calligaster (Wiegmann).*

|                | mm. |
|----------------|-----|
| Total length   | 462 |
| Snout to vent  | 427 |
| Tail           | 35  |
| Length of head | 12  |
| Width of head  | 8.5 |

*Color in alcohol.*—Above black-blue, traversed by 68 narrow, dotted rows of yellowish white (red in life?); head blue-black, the color extending down on side of head involving eye, the entire fourth and fifth labials, and the edges of their adjoining scales; snout yellowish; chin cream, the color extending to superior tem-

\* It is probable that the second nasal is really a loreal element.

porals, a black spot on fourth lower labial; tail flesh pink with 2 broad bluish bands, each divided by a very narrow light line, and separated from each other by 7 transverse scale rows; belly barred bluish black and cream (red in life).

*Variation.*—The Bureau of Science collection contains seven specimens; among these very marked variation in color obtains in specimens of different ages. The scale formulæ are rather uniform, with the exception of the wide range in ventral counts. The ventrals vary between 197 and 257; the subcaudals, between 19 and 23.

TABLE 58.—*Measurements and scale counts of Hemibungarus calligaster (Wiegmann).*

| No.   | Locality.                   | Collector.            | Sex. | Length.<br>mm. | Tail.<br>mm. | Ventrals. |
|-------|-----------------------------|-----------------------|------|----------------|--------------|-----------|
| 21    | Calauan, Laguna .....       | R. C. McGregor .....  | ♂    | 525            | 30           | 228       |
| 22    | Mount Banahao, Laguna ..... | M. L. Merritt .....   | ♀    | 322            | 22.5         | 286       |
| 23    | Samal, Bataan .....         | A. Celestino .....    | ♂    | 340            | 21           | 233       |
| 25    | Montalban, Rizal .....      | W. Schultze .....     | ♂    | 205            | 13           | 250       |
| 26    | .....                       | .....                 | ♀    | 210            | 13.5         | 216       |
| 27    | Montalban, Rizal .....      | W. Schultze .....     | ♀    | 493            | 30           | 251       |
| 28    | Los Baños, Laguna .....     | F. W. Foxworthy ..... | ♂    | 415            | 23           | 257       |
| ..... | do .....                    | .....                 | ♀    | 455            | 27           | 222       |
| 231   | Iloilo .....                | A. L. Howard .....    | ♂    | 462            | 35           | 197       |

| No.   | Subcaudals. | Labials. |        |            |                     | Preoculars. | Postoculars. | Collection.             |
|-------|-------------|----------|--------|------------|---------------------|-------------|--------------|-------------------------|
|       |             | Upper.   | Lower. | Enter eye. | Touch chin shields. |             |              |                         |
| 21    | 21          | 6        | 7      | 3, 4       | 4                   | 1           | 2            | Bureau of Science.      |
| 22    | 23          | 6        | 6      | 3, 4       | 4                   | 1           | 2            | Do.                     |
| 23    | 19          | 6        | 7      | 3, 4       | 4                   | 1           | 2            | Do.                     |
| 25    | 23          | 6        | 6-7    | 3, 4       | 4                   | 1           | 2            | Do.                     |
| 26    | 20          | 6        | 7      | 3, 4       | 4                   | 1           | 2            | Do.                     |
| 27    | 20          | 6        | 7      | 3, 4       | 4                   | 2-1         | 2-1          | Do.                     |
| 28    | 19          | 6        | 7      | 3, 4       | 4                   | 1           | 2            | Do.                     |
| ..... | 19          | 6        | 7      | 3, 4       | 4                   | 1           | 2            | College of Agriculture. |
| 231   | 20          | 6        | 7      | 3, 4       | 4                   | 2           | 2            | E. H. Taylor.           |

The specimen here described is the only one that has 2 preoculars, save one specimen that has 2 preoculars on one side.

In coloration the young are very different. No. 25, Bureau of Science collection, is cream, with 29 dark brown bands on body and 2 on tail, slightly narrower on the belly where they cover 2 or 3 ventrals, while on the back they cover 5 transverse scale rows; the head is yellow with a narrow band involving eyes, to mouth.

No. 22, Bureau of Science collection, is similar to No. 25 but has 23 black-brown bars on body, and 2 on tail; the dorsal part of the light interspaces has a brownish wash and the brown bars are darker on the edges which are bordered with lighter color; ventrally the bars inclose an irregular lighter area. Nos. 23 and 28, Bureau of Science collection, have 24 and 27 dark-bars, respectively, but the light interspaces, except on tail, are a shade lighter brown, bordered by narrow zigzag lighter lines; the lighter area on the ventral bars is wanting in these two specimens. No. 26 is a very young specimen, which has its 24 black bars entirely divided transversely by a narrow light line.

*Remarks.*—This species is found in all the eastern Philippines. Specimens are known from Luzon (many localities) and southern Mindanao. The type locality is probably Manila.

HEMIBUNGARUS MCCLUNGI sp. nov.

PLATE 33, FIG. 3; PLATE 34, FIGS. 3 AND 4

*Hemibungarus* sp. GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 214.

*Type.*—No. 24, Bureau of Science collection; collected on Polillo Island, October, 1909, by C. Canonizado.

*Description of type.*—This species is allied to *Hemibungarus calligaster*, but differs from it in having a shorter, stouter body, a larger, more elongate head, the second labial in contact with preocular, the black stripe across head absent, and a lower average of ventrals. Head distinct from neck; rostral narrowly visible from above, about as broad as deep; internasals broader than deep, their mutual suture slightly more than half that between prefrontals; latter broader than long, their suture with frontal forming a straight transverse line; frontal five-sided, very much wider and longer than supraoculars, the longest sides parallel; parietals narrow, elongate; nostrils pierced in posterior part of anterior nasal, which almost surrounds nostril; this followed by a second nasal (or loreal) element; a single preocular; 2 postoculars; 2 large anterior temporals; 6 upper labials, second in contact with preocular, third and fourth entering eye; 6 lower labials, 3 touching first chin shields, which are only slightly larger than second pair; ventrals, 206; anal single; subcaudals, 21.

*Color in alcohol.*—Above cream white traversed by 22 purplish bands about 6 scales wide; some of these bands are partially divided transversely by a light streak, visible ventrally and somewhat evident on sides; the first band on neck is broadest and reaches forward to parietals; the band is broadly interrupted on underside of neck, and is transversely divided dorsally; 2 bands

belong to tail; below, markings similar to dorsal markings except that the bands are more brown than purple; a black spot is present about eye.

*Measurements of Hemibungarus mcclungi sp. nov.*

|                | mm.  |
|----------------|------|
| Total length   | 190  |
| Snout to vent  | 175  |
| Tail           | 15   |
| Width of head  | 5.25 |
| Length of head | 9.25 |

*Remarks.*—This species is closely allied to *Hemibungarus calligaster* (Wiegmann). Table 59 shows the chief variations in size and proportions.

TABLE 59.—Measurements and scale counts of *Hemibungarus calligaster* (Wiegmann) and *H. mcclungi sp. nov.*

| No. | Species.                    | Length. | Tail. | Ventrals. | Head.   |        |        | Frontals. | Parietal length. | Between eyes. |
|-----|-----------------------------|---------|-------|-----------|---------|--------|--------|-----------|------------------|---------------|
|     |                             |         |       |           | Length. | Width. | Depth. |           |                  |               |
|     |                             | mm.     | mm.   |           | mm.     | mm.    | mm.    | mm.       | mm.              | mm.           |
| 25  | <i>H. calligaster</i> ----- | 205     | 13    | 250       | 8       | 4.5    | 3      | 1.9       | 2.8              | 2.8           |
| 23  | -----do-----                | 346     | 20    | 233       | 9.5     | 5.25   | 3.75   | 2.5       | 3.2              | 3             |
| 24  | <i>H. mcclungi</i> -----    | 190     | 15    | 206       | 9.25    | 5.25   | 4      | 2.6       | 3.4              | 3.5           |

Griffin failed to classify the specimen, but remarks "said to be the young of *H. calligaster* (Wiegmann)." The type is a young specimen, but the description will enable anyone to recognize the adult. This is another species for the more or less distinctive fauna of Polillo.

Genus DOLIOPHIS Girard

*Elaps*, part., SCHNEIDER, Hist. Amph. 2 (1801) 289, WAGLER, Syst. Amph. (1830) 193; SCHLEGEL, Phys. Serp. 2 (1837) 435; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1191; GÜNTHER, Cat. Col. Snakes (1858) 229; JAN, Rev. & Mag. Zool. (1858) 516.

*Maticora* GRAY, Ill. Ind. Zool. (1834) 2.

*Doliophis* GIRARD, Proc. Acad. Nat. Sci. Philadelphia (1857) 182; U. S. Expl. Exp., Herp. (1858) 175; BOULENGER, Cat. Rept. Brit. Mus. 3 (1896) 399.

*Helminthoelaps*, part., JAN, Rev. & Mag. Zool. (1858) 518.

*Callophis*, part., GÜNTHER, Proc. Zool. Soc. London (1859) 81; PETERS, Mon. Berl. Ak. (1862) 636; GÜNTHER, Rept. Brit. India (1864) 346; MEYER, Mon. Berl. Ak. (1869) 211; Proc. Zool. Soc. London (1870) 368; REINHARDT, Vid. Meddel. (1869) 117; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 441.

*Adeniophis* PETERS, Mon. Berl. Ak. (1871) 578; MEYER, Sitzb. Ak. Berl. (1886) 614; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117;

BOULENGER, Fauna Brit. India, Rept. (1890) 386; CASTO DE ELERA, Cat. Fauna Filipinas 1 1895) 441.

Maxillary extending forward beyond palatine, with a pair of large grooved poison fangs but no other teeth; mandibular teeth subequal; prefrontal bones in contact with each other on median line; head small, not distinct from neck; eye small with round pupil; nostril between 2 nasals; no loreal; body subcylindrical, elongate; scales smooth, without pits, in 13 rows; ventrals rounded; tail short; subcaudals in 2 rows; poison glands elongate, extending far into body cavity, gradually thickening, and terminating in a club-shaped end.

*Key to the Philippine species of Doliophis Girard.\**

$\alpha^1$ . Eye about half as long as its distance from mouth; frontal as long as, or a little shorter than, its distance from end of snout.

*D. philippinus* (Günther) (p. 277).

$\alpha^2$ . Eye much more than half as long as its distance from mouth; frontal as long as its distance from rostral..... *D. bilineatus* (Peters) (p. 274).

The genus is a comparatively small one, comprising only four species. It is distributed from Burma and Cochin China through the Malay Peninsula into the East Indian Archipelago, as far as Celebes. Two species are found in the Philippines which appear to be confined to the Archipelago. *Doliophis bilineatus* appears to be confined to Palawan, the Calamian Islands, Balabac, and Mindanao. The other, *D. philippinus*, occurs over the eastern part of the Islands, specimens being recorded from Luzon and Mindanao.

These species are both small, and are usually brightly colored on the belly with black and yellow or red bars. The tail has broad black and red rings. The snakes are poisonous, but the extent of the deadliness of the poison is not known. It is probable that it is quite as deadly as that of the other Elapine snakes, but the smaller size, with the consequent reduced size of the fangs, probably makes these snakes harmless to man under ordinary circumstances. *Doliophis bilineatus* is a common snake in Palawan, but *D. philippinus* appears to be extremely rare everywhere.

**DOLIOPHIS BILINEATUS (Peters)**

PLATE 34, FIGS. 5 AND 6; PLATE 35, FIG. 3

*Callophis bilineatus* PETERS, Sitz. Ber. Ges. Nat. Fr. Berlin (1881) 109; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117.

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\* Boulenger, Catalogue, states that the two genera *Doliophis* and *Callophis* are the same, save that in the former the poison glands extend along the sides of the body for one-third of the length, terminating in club-shaped ends in front of the heart. Heart shifted very far back.

*Adeniophis bilineatus* BOULENGER, Ann. & Mag. Nat. Hist. VI 14, (1894) 84; BOETTGER, Abh. Mus. Dresden 7 (1894-95) 5.

*Doliophis bilineatus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 404; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600; § D 6 (1911) 266.

*Description of species.*—(From No. 135, E. H. Taylor collection; collected on Palawan, 1913, by C. M. Weber.) (Adult male.) Head not distinct from neck or body, somewhat flattened; rostral small, barely visible from above, about as high as wide; suture with first labial very short, that with nasal about twice as long as that with internasal; latter small, bordering nostril above, very much wider than deep, pointed laterally above nostril; prefrontals large, two and a half times as long as internasals, about as wide as deep, not touching labials; frontal a little longer than broad, narrowed rapidly behind to a point, much shorter than its distance from end of snout, about equal to its distance from rostral; parietals longer than wide, longer than frontal but of nearly equal width, in contact with only the upper postocular; nostril large, pierced between 2 nasals, with internasal forming part of upper rim; anterior nasal largest, widest where it borders rostral, tapering toward nostril; posterior very much smaller, separating prefrontal from labial; loreal absent; 1 preocular; supraocular longer than wide, its length less than that of frontal but extending farther forward; 2 postoculars, subequal in size; temporals 1 + 2, both very large, anterior touching both postoculars; 6 upper labials, third and fourth entering eye, sixth and third largest; 5 lower labials, fifth narrowed to a point; 2 subequal pairs of chin shields, first bordered by 4 labials; mental small, half as wide as rostral; scales in 13 rows, smooth, without apical pits; ventrals, 249; anal entire; subcaudals, 30; eye small, about twice the diameter of nostril, its vertical diameter equal to, or a little less than, its distance from mouth.

*Color in alcohol.*—A large, median, black stripe from frontal to tail, covering three whole rows and two half rows of scales; behind supraocular begins a white line, covering two half rows of scales, extending to tail; behind eye a second black stripe begins and continues to tail, one whole and two half scales wide; below this, a white line one and a half scales wide; toward latter part of body there is a dotted line along the middle of the outer scale row; anteriorly the two black stripes merge in a band of black crossing head, involving the eyes but not reaching the mouth; a whitish band (red in life) in front of this; rostral dark; a white area (reddish in life) on each upper labial; ventrals with alternate bars of yellowish white and black, each bar two or three scales wide; the black encircles body at anus; chin with a dark

area in mental groove, and a spot on fourth lower labial; three broad pinkish bands, separated by narrow black bands, encircle tail; scute on extreme tip, pink.

*Measurements of Doliophis bilineatus (Peters).*

|                |     |
|----------------|-----|
|                | mm. |
| Total length   | 335 |
| Snout to vent  | 305 |
| Tail           | 30  |
| Length of head | 10  |

*Variation.*—Not a great deal of variation is evident in this species save in the ventral and the subcaudal counts; the table shows this variation in the specimens examined.

TABLE 60.—*Measurements and scale counts of Doliophis bilineatus (Peters).*

| No.   | Locality.       | Collector.  | Sex. | Length. | Tail. | Ventrals. |
|-------|-----------------|-------------|------|---------|-------|-----------|
|       |                 |             |      | mm.     | mm.   |           |
| 631   | Iwahig, Palawan | C. M. Weber | ♂    | 475     | 40    | 247       |
| 660   | do              | do          | ♂    | 450     | 31    | 252       |
| 662   | do              | do          | ♂    | 450     | 38    | 254       |
| 663   | do              | do          | ♂    | 450     | 35    | 261       |
| 664   | do              | do          | ♀    | 425     | 29    | 273       |
| 665   | do              | do          | ♀    | 475     | 28    | 275       |
| 681   | do              | do          | ♀    | 440     | 25    | 278       |
| 901   | do              | C. H. Lamb  | ♀    | 490     | 30    | 283       |
| 920   | do              | do          | ♂    | 445     | 35    | 260       |
| 949   | do              | do          | ♂    | 385     | 32    | 254       |
| 135   | Palawan         | C. M. Weber | ♂    | 335     | 30    | 249       |
| ----- | Mindanao        | Unknown     | ♀    | 478     | 30    | 283       |

| No.   | Sub-caudals. | Anal. | Pre-oculars. | Post-oculars. | Temporals. | Upper labials. | Labials enter eye. | Scale rows. | Collection.        |
|-------|--------------|-------|--------------|---------------|------------|----------------|--------------------|-------------|--------------------|
| 631   | 29           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Bureau of Science. |
| 660   | 27           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 662   | 30           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 663   | 30           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 664   | 23           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 665   | 23           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 681   | (a)          | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 901   | 25           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 920   | 28           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 949   | 28           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | Do.                |
| 135   | 30           | 1     | 1            | 2             | 1+2        | 6              | 3, 4               | 13          | E. H. Taylor.      |
| ----- | 24           | 1     | 1            | 2             | 1+2        | 5?             | 3, 4               | 13          | Santo Tomás.       |

<sup>a</sup> Mutilated.

The ventral average for males (seven specimens) 252; the subcaudal, 29.4; for females (five specimens) ventrals, 276; subcaudals, 24, making an average of 24 more ventrals and 5.4 less

subcaudals in females; the body measurements also vary, the tail in the females being shorter, and the body longer, than those in equal-sized males.

The color varies from black to reddish brown above; below, from yellow orange to red. The spot on the head is reddish. The dotted line on the outer row of scales may be present or absent.

Two other species, nonpoisonous, occurring in Palawan have practically the same general coloration as the species above. These are *Polyodontophis bivittatus* and *Dryocalamus philippinus*. These two species may be readily recognized by the long slender tail and the absence of markings on belly. In Busuanga *Doliophis bilineatus* is called *odto-odto* or *oro-odto* and is regarded as being deadly poisonous. These names are also applied to the two harmless snakes mentioned above.

When disturbed or injured the snake turns up the end of its tail showing the brilliant red markings on the underside of the tail, and then writhes about, sometimes jumping, throwing the body from the ground, sometimes turning over on its back and continuing its aimless gyrations.

The species is known from Busuanga, Palawan, and Balabac in the Palawan Group, where it appears common.

Boulenger reports a specimen from Mindanao. Certainly it is rare in the last-mentioned place. It is confined to the Philippines.

#### DOLIOPHIS PHILIPPINUS (Günther)

##### PLATE 35, FIGS. 1 AND 2

*Elaps intestinalis* var. GÜNTHER, Cat. Col. Snakes (1858) 230.

*Callophis intestinalis* GÜNTHER, Proc. Zool. Soc. (1859) 82, pl. 16 fig. A.

*Callophis intestinalis* var. *philippina* GÜNTHER, Rept. Brit. India (1864) 349.

*Adeniophis philippinus* MEYER, Sitzb. Ber. Ak. Wiss. Berlin 36 (1886) 614; BOETTGER, Ber. Senck. Nat. Ges. (1886) 117; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 441.

*Doliophis philippinus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 404; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 266; TAYLOR, Philip. Journ. Sci. § D 13 (1918) 261.

*Description of species.*—(From No. 54, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, November 12, 1912, by E. H. Taylor.) (Adult male.) Head small, not distinct from neck; rostral wider than deep, the portion visible from above a mere line, forming its narrowest suture with labial; internasals less than one-third the size of prefrontals, their mutual suture shortest; prefrontals in contact with posterior nasal and the

elongate preocular; frontal small, not twice as wide as supraocular, three-fourths as wide as long, nearly triangular, not as long as its distance from end of snout; parietals longer than frontal, slightly narrower; 2 nasals, the anterior largest; no loreal; preocular large, much longer than wide; supraoculars about as wide as long; 2 small postoculars, the superior largest; temporals 1 + 2, anterior large, followed by one of equal size, and a smaller one below; 6 upper labials, third and fourth entering eye; labials in the following order of size: sixth, third, fifth, fourth, second, first; 6 lower labials, 4 touching anterior chin shields; eye small, about half as long as its distance from mouth; 2 pairs of chin shields, subequal in length; scales in 13 smooth rows, without apical pits; ventrals, 245; anal single; subcaudals, 25; tail short.

*Color in life.*—Above a dark yellowish brown, each scale edged with darker; a median darker line, beginning on neck, continuing the length of body, broken occasionally by a yellowish spot; on either side of this darker median line are 2 lighter stripes, below which the ground color breaks into bands which encircle belly; these narrow ventrally and number 43 on body, with 2 on tail; below, they are dark brown to black, covering 4 or 5 ventral scales, and are separated by orange-colored bands, which cover 2 or 3 ventral scales but narrow on sides; they extend usually to fourth row of scales; the irregular series of dim light spots on the median dorsal dark line are between the ends of the light abdominal bands; head brown, with indistinct darker shading; darker between eyes and on tip of snout; a black spot in the middle of sixth labial; chin variously mottled with brown and light; first labials with light spots; a white line crosses sixth labial; chin spotted with dark; bands under tail a brilliant scarlet, much wider than those on belly, almost surrounding tail.

*Measurements of Doliophis philippinus (Günther).*

|                | mm.  |
|----------------|------|
| Total length   | 625  |
| Snout to vent  | 576  |
| Tail           | 49   |
| Width of head  | 9.5  |
| Length of head | 13.5 |

*Variation.*—As compared with the type, the described specimen differs in having the frontal somewhat shorter than its distance from end of snout; the ventrals are very much more numerous than in the type, the latter having only 218, while our specimen has 245; the number of subcaudals is nearly equal. The known range of ventrals is 218 to 255; of subcaudals, 25 to 27.

The second Bunawan specimen, No. 53, E. H. Taylor collection, is much darker brown, and the bands on the belly, 38 in number, are black. In the Manila specimen the median dark line is broken regularly by the yellowish longitudinal spots, which are about one-third as long as the intervening dark areas. There are 41 bands on the belly.

A young specimen captured near Zamboanga, Mindanao, has only three labials touching the anterior chin shields, and varies markedly from the usual markings. The head is yellow, a black spot involving the eye, and there is a spot on the sixth labial. Instead of the median dark line, broken by a light spot, there is a light line broken by short, black, rectangular spots, less than half the length of the intervening light areas; on either side of the median line is a dark brown, darker-edged stripe beginning at the eye and continuing regularly and unbroken to the tail; the belly is barred with bands of black and yellow, the color reaching laterally up to the fourth scale row; the black bars are wider laterally, covering two or three ventral scales; there are a few spots on the chin; the tail is reddish below, with two narrow black bars.

TABLE 61.—Measurements and scale counts of *Doliophis philippinus* (Günther).

| No.   | Locality.             |  |  |  | Collector.         |  | Sex or age. | Length.    |
|-------|-----------------------|--|--|--|--------------------|--|-------------|------------|
| 53    | Bunawan, Agusan ..... |  |  |  | E. H. Taylor ..... |  | ♀           | mm.<br>545 |
| 54    | do .....              |  |  |  | do .....           |  | ♂           | 625        |
| 711   | Manila .....          |  |  |  | Mrs. Graham .....  |  | ♀           | 440        |
| R 422 | Zamboanga .....       |  |  |  | E. H. Taylor ..... |  | yg          | 180        |

| No.   | Tail. | Ventrals. | Subcaudals. | Upper labials. | Labials enter eye. | Scale rows. | Collection.        |
|-------|-------|-----------|-------------|----------------|--------------------|-------------|--------------------|
|       | mm.   |           |             |                |                    |             |                    |
| 53    | 40    | 255       | 27          | 6              | 3, 4               | 13          | E. H. Taylor.      |
| 54    | 49    | 245       | 25          | 6              | 3, 4               | 13          | Do.                |
| 711   | 30    | 261       | 26          | 6              | 3, 4               | 13          | Bureau of Science. |
| R 422 | 14    | 244       | 27          | 6              | 3, 4               | 13          | Do.                |

*Remarks.*—The type, a male specimen, was collected in the Philippines by H. Cuming, the exact locality being no longer known. In habits the species is very similar to its congener, *Doliophis bilineatus*, and the curious habits recorded under that species have also been observed in this species. It is a much

rarer form. The specimens I collected in Mindanao were found under rotting logs; when exposed to the light they lay quiet, making no endeavor to escape; when disturbed they began their aimless writhing and jumping. Known from Bunawan, Zamboanga, Mindanao, and Luzon. The species appears to be confined to the Philippines.

### AMBLYCEPHALIDÆ

*Amblycephalidæ* GÜNTHER, Rept. Brit. India (1864) 324; BOULENGER, Fauna Brit. India, Rept. (1890) 414; Cat. Snakes Brit. Mus. 3 (1896) 438.

"Facial bones slightly movable; præfrontal not in contact with nasal; ectopterygoid (transpalatine) present; pterygoid short, not extending to quadrate or mandible; supratemporal rudimentary; maxillary horizontal, parallel with or converging posteriorly towards the palatine. Mandible without coronoid bone. Solid teeth in both jaws.

"The hypapophyses disappear in the anterior third of the dorsal vertebral column." (*Boulenger.*)

The family contains five genera, two of which are confined to southeastern Asia and the Malay Archipelago, and three are confined to Central and South America. Not poisonous. *Haplopeltura* is the only Philippine genus.

### Genus HAPLOPELTURA Boulenger

*Dipsas*, part., SCHLEGEL, Phys. Serp. 2 (1837) 257.

*Aplopeltura* DUMÉRIl and BIBRON, Mem. Ac. Sci. 23 (1853) 463; Erp. Gén. 7 (1854) 444.

*Amblycephalus* GÜNTHER, Cat. Col. Snakes (1858) 184; JAN, Elenco Sist. Ofid. (1863) 100; GÜNTHER, Rept. Brit. India (1864) 325; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 438.

*Haplopeltura* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 439.

"Maxillary bone very short, deep, with five subequal teeth; maxillary and mandibular teeth decreasing in size posteriorly. Head distinct from neck; eye large, with vertical pupil; nasal entire. Body strongly compressed; scales smooth, without pits, oblique, in 13 rows, vertebral row strongly enlarged; ventrals rounded. Tail moderate; subcaudals single." (*Boulenger.*)

The genus contains a single species, which has a wide distribution from the Malay Peninsula throughout the Malay Archipelago.

### HAPLOPELTURA BOA (Boie)

PLATE 34, FIGS. 7 TO 9

*Amblycephalus boa* BOIE, Isis (1828) 1034; GÜNTHER, Cat. Col. Snakes (1858) 184; Rept. Brit. India (1864) 325; JAN, Icon. Gén. (1870)

- 37, pl. 3, fig. 2; MODIGLIANI, Ann. Mus. Genova, II 7 (1889) 120; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81; BOETTGER, Ber. Senck. Nat. Ges. (1886) 115; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 438.
- Dipsas boa* SCHLEGEL, Phys. Serp. 2 (1837) 284, pl. 11, figs. 29, 30; CANTOR, Cat. Mal. Rept. (1847) 78, pl. 40, fig. 3.
- Aplopeltura boa* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 444.
- Haplopeltura boa* BOETTGER, Ber. Offenb. Ver. Nat. (1892) 134; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 439; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 267.

*Description of species.*—(From No. 165, E. H. Taylor collection; collected at Bunawan, Agusan, Mindanao, September 29, 1912, by E. H. Taylor.) (Adult female.) Head short and deep; rostral very narrow, nearly twice as high as wide, forming its longest suture with nasal; just visible from above; sutures with internasals smallest; internasals twice as broad as long, in contact with highest loreal, forming its shortest suture with it; sutures with prefrontals and nasals subequal; prefrontals not as wide as internasals, but longer and larger; prefrontal suture shorter than that between internasals; frontal very large, one and two-thirds times to twice as long as broad, narrowed in the middle, longer than parietals, and much longer than its distance from end of snout, not twice as wide as supraoculars, in contact with upper preocular; parietals but little longer than wide, somewhat broken up behind, followed by several, somewhat enlarged, occipital shields; nasal single, in contact with 2 labials and 3 loreals; latter superimposed, upper nearly square, largest, lower longest, not entering eye, in contact with 2 labials; 2 preoculars, upper largest; 4 suboculars (3 on left side) in a row, continuous with preoculars; no postoculars; supraoculars elongate, extending above and behind eye, nearly half surrounding it; temporals 3 + 3; 9 upper labials, none entering eye; 12 lower labials; mental small with first 2 pairs of labials in contact behind it; the usual chin shields are replaced by 3 unequal pairs of broad plates, filling all the space between labials and first ventrals; the usual groove is missing on chin; eye very large, equal or very nearly equal to its distance from end of snout, greater than its distance from mouth; head short, narrow, and very thick, distinct from neck, with 2 rather prominent occipital knobs; scales in 13 rows, the median row enlarged, and an enlarged outer row; tail prehensile, sharply pointed; body much compressed; ventrals, 156; anal single; subcaudals, 104; tail narrows very greatly immediately behind anus.

*Color in life.*—Above yellowish brown of varying shades, with large, irregular, darker and lighter blotches; small black dots

scattered over body; a darker area from occipital region to frontal; remaining part of head a dim reddish yellow color, darkly powdered with brown; a broad dark line from eye to mouth, with a creamy yellow spot before and behind it, covered with dark minute spots of brown; a light area on temporal region; rostral dark; mental brownish; chin and throat light cream, powdered sparsely with brown.

*Measurements of Haplopeltura boa (Boie).*

|              |            |
|--------------|------------|
| Total length | mm.<br>617 |
| Tail         | 200        |
| Head width   | 11         |
| Head length  | 17         |

*Variation.*—There is marked variation in the number of ventrals and subcaudals. Boulenger\* records the following range: ventrals, 148 to 170; subcaudals, 88 to 120. This range does not seem to be due to sex variation, as is the case in many species.

TABLE 62.—*Measurements and scale counts of Haplopeltura boa (Boie).*

| No.  | Locality.       | Collector.   | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Anal. |
|------|-----------------|--------------|------|---------|-------|-----------|-------------|-------|
|      |                 |              |      | mm.     | mm.   |           |             |       |
| 163  | Bunawan, Agusan | E. H. Taylor | ♂    | 698     | 240   | 156       | 106         | 1     |
| 164  | do              | do           | ♂    | 637     | 225   | 156       | 108         | 1     |
| 165  | do              | do           | ♀    | 617     | 200   | 156       | 104         | 1     |
| 1741 | do              | do           | ♀    | (a)     |       |           |             | 1     |

| No.  | Preoculars. | Postoculars. | Temporals. | Upper labials. | Lower labials. | Suboculars. | Loreals. | Scale rows. | Collection.        |
|------|-------------|--------------|------------|----------------|----------------|-------------|----------|-------------|--------------------|
| 163  | 3           | 0            | 3+3        | 8              | 10             | 4           | 3        | 13          | E. H. Taylor.      |
| 164  | 3           | 0            | 4+4        | 9              | 9              | 4           | 3        | 13          | Do.                |
| 165  | 2           | 0            | 4+3        | 9              | 12             | 3-4         | 3        | 13          | Do.                |
| 1741 | 3           | 0            | 4+4        | 9              | 10             | 4           | 3        | 13          | Bureau of Science. |

\* Badly mutilated.

*Remarks.*—This snake has remarkable protective coloration and lives for the most part about dead trees. All specimens I have taken were found in such localities. On being disturbed they would fall to the ground where they would stiffen so as to appear like sticks, and could be picked up, still somewhat rigid. Their imitation of a stick is especially good, since the coloration has the appearance of lichens on dead wood.

\* Loc. cit.

Known from eastern Mindanao, Palawan, and Balabac, in the Philippines. Also known from Malay Peninsula, Java, and Borneo. It appears to have been collected in the Islands for the first time by Cuming, 1834-40.

## CROTALIDÆ

Maxillary vertically erectile, perpendicular to the ectopterygoid: pterygoid reaching quadrate or mandible; equipped with large, curved, hollow fangs; a deep pit in maxillary, represented externally by a blind sac. Poison gland confined to head. Deadly poisonous.

A single genus of this family is represented in the Philippines.

## Genus TRIMERESURUS Lacépède \*

*Lachesis* DAUDIN, Hist. Rept. (1803) 349; WAGLER, Syst. Amph. (1830) 175; GRAY, Zool. Misc. (1842) 50; Cat. Vip. Snakes (1849) 13; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1483; PETERS, Mon. Berl. Ak. (1862) 673; JAN, Elenco Sist. Ofid. (1863) 124; BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 529.

*Trimeresurus*, part., LACÉPÈDE, Ann. Mus. 4 (1804) 209

*Tropidolæmus* WAGLER, Syst. Amph. (1830) 175; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1523.

*Trigonocephalus* OPPEL, Ordn. Rept. (1811) 50; PETERS, Mon. Berl. Ak. (1862) 672.

*Trimeresurus* GRAY, Zool. Misc. (1842) 50; Cat. Vip. Snakes (1849) 13; PETERS, Mon. Berl. Ak. (1862) 672.

*Megæra* WAGLER, Syst. Amph. (1830) 174; GRAY, Zool. Misc. (1842) 49; Cat. Vip. Snakes (1849) 11; PETERS, Mon. Berl. Ak. (1862) 671.

*Parias* GRAY, Cat. Vip. Snakes (1849) 11.

*Bothrops* WAGLER, in Spix, Serp. Bras. (1824) 50.

"Upper surface of head covered with scales or small shields. Body cylindrical or compressed; scales smooth or keeled, with or without apical pits. Tail moderate or short; subcaudals single or in two rows." (*Boulenger.*)

Southeastern Asia, Malaysia, Central America, and South America. Snakes of this genus are commonly known as pit vipers. They are deadly poisonous.

Key to the Philippine species of *Trimeresurus* Lacépède.

a<sup>1</sup>. Head scales smooth.

b<sup>1</sup>. Supraocular narrow.

c<sup>1</sup>. Uniform yellow, with dark yellow lateral streak.

T. mcgregori Taylor (p. 284).

c<sup>2</sup>. Tail purplish brown, with or without small yellowish dorsal spots; no lateral yellow or white stripe; tail dark, like body.

T. halleus Griffin (p. 286).

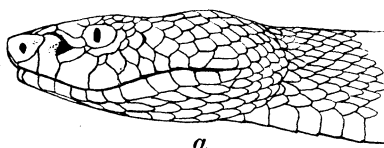
\* The synonymy refers chiefly to designation of Philippine forms.

- c<sup>3</sup>. Green or bluish above with or without a series of brown spots; a lateral whitish yellow line; ventrals, 170 to 187; tail light colored..... *T. flavomaculatus* (Gray) (p. 288).
- c<sup>4</sup>. Above green, a yellow line below eye; a lateral yellow stripe; tail colored like rest of body; ventrals, 145 to 170.  
*T. gramineus* (Shaw) (p. 290).
- b<sup>2</sup>. Supraocular large. Ventrals, 187 to 203; subcaudals, 66 to 82; tail light color..... *T. schultzei* Griffin (p. 292).
- a<sup>2</sup>. Upper head scales keeled; gular scales keeled; body scales keeled.
- b<sup>1</sup>. Scale rows, 21 to 25; 10 to 15 scale rows between supraoculars.  
*T. wagleri* (Boie) (p. 296).
- b<sup>2</sup>. Scale rows, 19; 7 scales between supraoculars.  
*T. philippensis* Gray (p. 295).

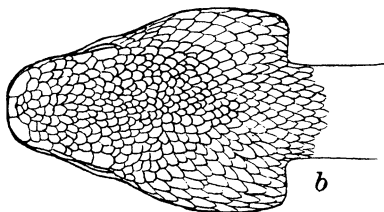
### TRIMERESURUS MCGREGORI Taylor

*Trimeresurus mcgregori* TAYLOR, Philip. Journ. Sci. 14 (1919) 110.

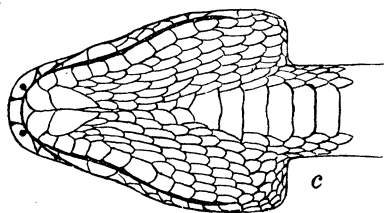
*Description of species.*—(From the type, No. 748, Bureau of Science collection; collected on Batan Island, Batanes, lying between Luzon and Formosa, June 12, 1907, by Richard C.



a



b



c

FIG. 31. *Trimeresurus mcgregori* Taylor; from the type; a, head, lateral view; b, head, dorsal view; c, head, ventral view;  $\times 1$ .

McGregor.) Rostral a little wider than high, slightly narrower at top, visible above as a narrow line, bordered behind by a rectangular scale, distinctly enlarged, which separates the 2 much-enlarged supranasals; latter not or barely in contact with rostral, separated from anterior supraocular by 3 (4 on right side) scales; 2 enlarged supraoculars, followed by 1 or 2 small scales above eye; nasal single, large, triangular, visible above as a narrow line, the nostril, which is vertically oval, pierced near lower border; canthus rostralis sharp, formed by edge of nasal, the narrow elongate loreal following nasal and superior preocular; facial pit surrounded by second labial, which forms anterior border of pit, and by middle and lower preoculars,

which are much elongated; 3 preoculars; a narrow elongate subocular, as long as orbit; 2 or 3 postoculars; 10 supralabials,

first small, triangular, narrowly in contact with rostral; second high, reaching almost to canthus rostralis; third much the largest, broadly in contact with subocular; fourth and fifth scales each separated from subocular by a single scale; temporal scales distinctly enlarged, larger than or as large as posterior labials; mental broadly triangular, wider than rostral; 11 lower labials, first, seventh, and eighth largest; a pair of large chin shields, much longer than wide, broadly in contact, bordered by 3 labials; 5 pairs of scales between chin shields and first ventral; 28 scales from angles of mouth across occiput; 13 scales between supraoculars; 29 scale rows on neck (at seventh ventral); 21 rows on body; ventrals, 175; subcaudals, 56; anal single; temporal scales perfectly smooth; body scales slightly keeled on the 8 or 10 median rows; head rather angular, flattened above, and depressed in supraocular region; tail prehensile.

*Color in life.*—Above, bright yellow with a darker yellow lateral streak (in alcohol entire snake almost paper white with practically no trace of marking); tail with a few small, reddish brown spots near tip.

*Measurements of type and cotype of Trimeresurus mcgregori Taylor.*

|                     | Type.<br>mm. | Cotype.<br>mm. |
|---------------------|--------------|----------------|
| Total length        | 865          | 702            |
| Tail                | 120          | 100            |
| Head width          | 25           | 25             |
| Head length         | 36           | 33             |
| Eye to end of snout | 12           | 9.2            |
| Eye to mouth        | 6            | 5              |
| Supraocular width   | 16           | 14             |
| Length of eye       | 4.5          | 4              |
| Width of eye        | 3.2          | 2.8            |

*Variation.*—A second specimen from the same locality shows the following variations. The scale counts are as follows: ventrals, 179; subcaudals, 59; scale rows on neck (at seventh ventral), 29; body, 21; scales between eyes, 13; upper labials, 11–10; lower labials, 12; 3 scales behind supranasals bordering rostral. On the right side, the third labial does not touch suboculars; the lateral stripe covers one whole and a half scale rows.

*Remarks.*—This species belongs to the *Trimeresurus gramineus* (Shaw) group, which includes *T. flavomaculatus* and *T. haliensis* of the Philippines. It is differentiated from the other species, however, by the striking color with no dark markings, the larger number of scales on snout and supraocular region, and the larger unkeeled temporals; the supranasals are larger and more clearly differentiated. Mr. McGregor, its discoverer, and for

whom it has been named, states that it is not rare on Batan Island. In a memorandum dated June 12, 1907, he states the following:

Our party went to the summit of the mountain. On the return a large yellow snake was found resting at about 2 meters from the ground coiled on some leaves that had lodged among the thick stems of a kind of large grass.

The snake was struck with an alpen-stock and fell to the ground. In attempting to put a string on its neck I was scratched by the fangs, between the last two joints of my thumb. Mr. H. G. Ferguson immediately made several cuts across the wound with a pocket knife and tied a string around the thumb. My hand and forearm were swollen by evening. The swelling subsided within a couple of days. There was very little pain, and no further trouble was experienced.

#### TRIMERISURUS HALIEUS Griffin\*

*Trimerisurus halieus* GRIFFIN, Philip. Journ. Sci. § D 5 (1910) 214  
(*Trimerisurus* err. typ.) § D 6 (1911) 267.

*Description of species.*—(From No. 772, Bureau of Science collection; collected on Polillo, October 1, 1909, by C. Canonizado). Head broadly triangular; canthus rostralis rather rounding; rostral broader than high, bordered behind by 2 internasal scales; supranasals somewhat enlarged; nasal irregular, undivided, a small scale between nasal and first 2 labials; first labial small, triangular; second high, entering pit and forming its anterior border, in contact with the elongate canthal scale which lies between the 2 superior preoculars and with the nasal; pit surrounded by 2 preoculars and first labial; supraocular enlarged, irregular in shape; a narrow elongate subocular, touching inferior preocular and third and fourth labials (third only on left side); separated from other labials by a single row of scales; 3 preoculars, 3 postoculars; 10 upper labials, 12 lower labials; 3 labials border the single pair of chin shields; mental triangular, pointed behind; 12 scales between supraoculars; 28 scales across head between angle of jaws; temporal scales rather enlarged, not keeled; scales on head irregular in size and shape, rather rounding, and not or but slightly imbricate, not keeled; scales on posterior part of head imbricate and pointed; scale rows on neck (counting from tenth ventral), 25; on body 21; median 10 rows of scales distinctly keeled, more prominently on posterior part; ventrals, 178; subcaudals, 56; tail distinctly prehensile; anal single.

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\* In establishing this species Griffin had before him ten specimens from Polillo, the only locality where it has been found. No particular specimen was designated as the type.

*Color in alcohol.*—Purplish brown with a few, very small, yellowish brown spots on posterior part of body; below dull purplish, the ventrals with light edges; tail uniform color like body; no trace of a lateral light line.

*Measurements of Trimeresurus halius Griffin.*

|               | mm. |
|---------------|-----|
| Total length  | 912 |
| Snout to vent | 782 |
| Tail          | 130 |
| Head length   | 41  |
| Head width    | 27  |

*Variation.*—The ventrals range between 170 and 182; the subcaudals between 52 and 59. There are 10 to 13 scales between the supraoculars; certain of the specimens are a uniform color, others have large, distinct, irregular, brown bands, in some specimens continuing even on the tail; this is not due to age, as some of the smallest and some of the largest specimens are so marked. In life the specimens are often green.

*Remarks.*—This species is very closely related to *Trimeresurus flavomaculatus*, and *T. gramineus* is separated from both chiefly by color. The scale differences are rather negligible. The average of ventrals in the Polillo form is 178; of subcaudals, 55, which is 7 or 8 lower than the average for *T. flavomaculatus*. The very characteristic white line along the outer scale rows is usually wanting.

Griffin \* remarks on its habits:

The specimens were all collected along the banks of streams or in damp localities.

This snake seems to leave the ground very rarely. When the natives of the islands go at night along the streams to catch mudfish by torchlight the snakes are commonly seen near the edge of the water, and the fishermen say that they are there for the same purpose as themselves, and for this reason call the snake *Mánda-dalág*, which, literally translated, means "the fisher of the *dalág* (or mud-fish)." Sr. Cesario Canonizado captured one specimen which had buried most of its body in the sand close to the water's edge. The place where the snake was lying was partly covered with water, while a few inches away was deeper water in which numerous small fish were swimming about for which the snake *appeared* to be lying in wait. \* \* \*

The stomach of No. 764 contained an entire frog. In the intestine of No. 763 were found a few scales, probably of a fish. The intestine of No. 765 contained a large ball of hair of a rat.

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\* Philip. Journ. Sci. § D 5 (1910) 214.

I have examined recently a single freshly preserved specimen from the Patnanongan Island, east of Polillo. The color above is green, lighter on the sides; the belly is yellowish green; medially there is a series of irregular, reddish brown blotches from the head to the end of the body; there is a broken series of bright yellow spots along the sides of the body, more prominent toward the tail; sometimes the yellow color extends slightly on the ventral. The skin between the scales is black and flesh color, alternating dorsally, the black area widening on the sides; the edges of the scales over the black area are somewhat bluish. The tail is dark lavender traversed by 16 black bars which do not meet below; below, behind anus, the tail is blue and yellow, spotted black; on the latter half the color is grayish white. There are 181 ventrals and 59 subcaudals. It is highly probable that this species will later be regarded as a subspecies of *Trimeresurus flavomaculatus*. It will be remembered that Gray designated three forms under the names *flavomaculata*, *ornata*, and *variegata*.

#### TRIMERESURUS FLAVOMACULATUS (Gray)

*Megæra flavomaculata* GRAY, Zool. Misc. (1842) 49.

*Megæra ornata* GRAY, Zool. Misc. (1842) 49.

*Megæra variegata* GRAY, Zool. Misc. (1842) 50.

*Parias flavomaculata* GRAY, Cat. Vip. Snakes (1849) 11.

*Parias ornata* GRAY, Cat. Vip. Snakes (1849) 11.

*Parias variegata* GRAY, Cat. Vip. Snakes (1849) 11.

*Trimeresurus flavomaculatus* GÜNTHER, Proc. Zool. Soc. (1879) 79; GRIFFIN, Philip. Journ. Sci. § D 6 (1911) 267.

*Trimeresurus schadenbergi* FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 116.

*Lachesis flavomaculatus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 556.

*Trimeresurus gramineus* MÜLLER, III. Nacht. Cat. Herp. Samml. Basel Mus. (1883) 19.

*Description of species*.—(From No. 64, Bureau of Science collection.) Snout rather short; head not especially flattened; rostral broader than high, narrowed at top to less than half its width, bordered behind by 2 internasal scales, visible from above; supranasals enlarged, separated from each other by 2 scales, and from loreal by a single scale; loreal folded across canthus, which is not sharp but rather rounded; supraoculars longer than diameter of eye, extending some distance in front of their anterior vertical level; 10 scales in a line between supraoculars; scales on the head imbricate, smaller on back part of head; nasal large, nostril pierced in its middle lower part; 9 upper labials, first small, second large, forming anterior border of pit, third largest,

last 5 subequal in size; a large, narrow, semicircular subocular touching third labial, separated from others by a single row of enlarged scales; 3 preoculars, the middle and lower forming the upper and lower borders of pit, upper largest, all entering eye; 3 postoculars, lower temporal scales larger than upper, no trace of keels present; 11 to 12 lower labials; mental triangular, pointed behind chin shields, in contact with 3 labials; body scales narrow, pointed sharply behind, faintly keeled on the 8 median rows, in 21 rows around body; 25 about neck; ventrals, 180; subcaudals, 69; anal single.

*Color in alcohol.*—Above ultramarine blue with a series of about 54 irregular brown spots on back; head reticulated with brown; laterally with a series of yellowish, small spots, usually connected, intermixed with brownish, involving edges of some ventrals and some scales of the second row; below greenish blue, the ventrals edged with whitish; chin with numerous white or

bluish white scales, forming a light spot at angle of jaws; tail variegated with bluish and lavender-brown, lighter toward tip; lateral spots of yellow and brown on ventral part of tail; skin between scales brownish; eye moderate, the length equal to its distance from mouth.

*Measurements of Trimeresurus flavomaculatus (Gray).*

|               | mm. |
|---------------|-----|
| Total length  | 855 |
| Snout to vent | 712 |
| Tail          | 143 |

*Variation.*—Specimens I have examined in the Bureau of Science collection, and those of Santo Tomás University, have the following variation in scalation: Ventrals, 171 to 182, average, 178; subcaudals, 56 to 69, average, 63. Boulenger records the

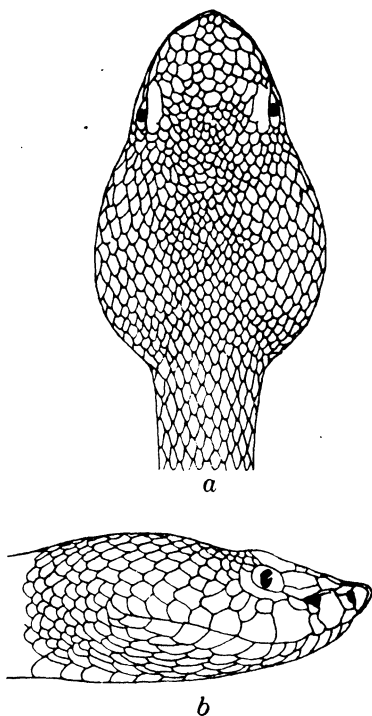


FIG. 32. *Trimeresurus flavomaculatus* (Gray); after Boulenger's *Lachesis flavomaculatus*; a, head, dorsal view; b, head, lateral view.

following scale variations: Ventrals, 170 to 187, average, 179; subcaudals, 55 to 73, average, 62. The larger proportion of specimens I have examined (five out of nine) have 2 labials touching subocular; upper labials vary between 9 and 11, 10 being the usual number; lower labials, 10 to 13, 11 being the usual number; 9 or 10 rows of scales between supraoculars, 10 predominating. The scale rows are invariably 21 (neck 25.) The color and markings vary considerably; usually a bright or olive green in life (bluish in alcohol), either uniform or with numerous brown spots or blotches; the skin between the scales brownish or blackish; the broken line of yellow dots on the outer scale rows is very characteristic of this species, and is present in all specimens examined.

*Remarks.*—This species is found only in the Philippines, apparently. Specimens have been reported from Luzon, Mindanao, and Batan Island,\* north of Luzon. Two specimens in the Santo Tomás Museum are labeled Bohol and Jolo, respectively.

#### TRIMERESURUS GRAMINEUS (Shaw)

*Coluber gramineus* SHAW, Gen. Zool. 3<sup>d</sup> (1802) 420.

*Coluber viridis* BECHSTEIN, Lacépède's Naturg. Amph. 4 (1802) 252, pl. 39, fig. 1.

*Vipera viridis* DAUDIN, Rept. 6 (1803) 112.

*Trimeresurus viridis* LACÉPÈDE, Ann. Mus. Paris 4 (1804) 209; GRAY, Cat. Vip. Snakes (1849) 7; Ann. & Mag. Nat. Hist. II, 12 (1853) 391.

*Cophias viridis* MERREM, Tent. Syst. Amph. (1820) 155.

*Trigonocephalus viridis* SCHLEGEL, Phys. Serp. 2 (1837) 344, pl. 19, figs. 12 and 13.

*Trigonocephalus erythrurus* CANTOR, Proc. Zool. Soc. London (1839) 31.

*Trimeresurus albolabris* GRAY, Zool. Misc. (1842) 48.

*Trigonocephalus gramineus* part., CANTOR, Cat. Mal. Rept. (1847) 119.

*Trimeresurus elegans* GRAY, Ann. & Mag. Nat. Hist. II, 12 (1853) 391.

*Bothrops viridis* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1512. PETERS, Mon. Berl. Ak. (1861) 691.

*Trimeresurus gramineus* GÜNTHER, Rept. Brit. India (1864) 385; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 216; ANDERSON, Proc. Zool. Soc. London (1871) 194; An. Zool. Res. Yunnan (1879) 828; THEOBALD, Cat. Rept. Brit. India (1876) 219; FISCHER, Jahrb. wiss. Anst. Hamburg 2 (1885) 81; BOETTGER, Ber. Senck. Nat. Ges. (1887) 50; (1888) 188; (1894) 135; BOULENGER, Fauna Brit. India, Rept. (1890) 429; SCLATER, Journ. As. Soc. Bengal 60 (1891) 248; STEJNEGER, Journ. Sci. Coll. Tokyo 12<sup>d</sup> (1898) 225; Bull. U. S. Nat. Mus. 58 (1907) 480; GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600.

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\* These two specimens, recorded by Griffin (loc. cit.), are referred to a distinct species.

*Trimeresurus erythrurus* GÜNTHER, Rept. Brit. India (1864) 386; STOLICZKA, Journ. As. Soc. Bengal 39 (1870) 217; FAYRER, Thanatoph. Ind. (1874) pl. 14; THEOBALD, Cat. Rept. Brit. India (1876) 220; MÜLLER, Verh. Nat. Ges. Basel 8 (1887) 280; BOETTGER, Ber. Senck. Nat. Ges. (1886) 119.

*Lachesis gramineus* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 554; BOETTGER, Kat. Schl. Mus. Senck. (1898) 139.

*Description of species.*—(From Stejneger, Bull. U. S. Nat. Mus.) "Adult male; U. S. N. M. No. 36516; Taihoku (Taipa), Formosa; \* \* \* Rostral as high as broad, very narrow above, nearly triangular bordered behind by a single scale between the upturned anterior corners of the nasal, just visible from above; canthus rostralis sharp, formed anteriorly by the upturned edge of the nasal, the upturned edge of an elongated shield corresponding to the loreal \* \* \* and the upturned portion of the upper preocular; head shields small, smooth anteriorly, keeled on parietal and occipital regions; supraoculars very narrow, occupying only the outer edge of the supraocular region, their width being scarcely more than one-fifth the distance between them; about 12 scales on a line between the supraoculars; nasal large, smooth, undivided, with a round nostril pierced near the lower edge; behind it above, on the canthal ridge an elongated shield, being the loreal of the other species; below it, separating it from the first supralabial, and between nasal and the upper portion of second supralabial which enters the pit, two small scales, one above the other, two elongate anterior preoculars, the upper, which is somewhat wider anteriorly turned up over the canthal ridge, the lower forming the upper border of the large pit; the subfoveal as large as the lower preocular, posteriorly entering eye between the latter and the subocular; a long, narrow, crescentic subocular anteriorly in contact with subfoveal, separated from fourth and subsequent supralabials by one and posteriorly two rows of scales; three small postoculars on left side, two on right; temporals numerous, lower ones largest, upper ones smaller, keeled; 10 supralabials, first small, triangular, second very high, forming anterior border of pit, third largest, fourth slightly larger than fifth to tenth, which are subequal; 3 lower labials in contact with anterior chin-shields, posterior chin-shields scarcely differentiated; 21 rows of narrow, pointed, keeled scales without apical pits; 161 ventrals; anal entire; 69 pairs of subcaudals; tip of tail rather blunt. Color (in alcohol) above saturated uniform 'parrot-green,' from the subocular, under the center of the eye, a narrow, strongly defined, pale-yellowish line, the lower row of temporals

and across the last supralabial to the side of neck and from there to near the tip of the tail on the middle line of the outer scale row, the lower edge of which is somewhat darker than the rest of the body; underside paler green, washed with blue so as to be almost 'beryl-green' toward the sides; tips of tail colored like the rest of the body.

*Measurements of Trimeresurus gramineus (Shaw).*

|                     | mm. |
|---------------------|-----|
| Total length        | 618 |
| Snout to vent       | 488 |
| Vent to tip of tail | 130 |

"The female appears to have a relatively much shorter tail."

*Variation.*—This widely distributed species is quite variable in scalation and color. According to Boulenger,\* the ventral range is 145 to 175, average, 162.5; subcaudal, 53 to 75, average, 60. Rarely there are 19 or 23 rows. The scales between oculars vary between 8 and 13; the nasal is sometimes divided; the temporal scales are smooth. Bright green, rarely olive or yellowish, with or without crossbands; the yellow streak is usually present.

*Remarks.*—Known from India to Formosa, Siam, Sumatra, Java, Timor, and Borneo. In the Philippines it has been reported from Paracale, Luzon, by Peters, as *Bothrops viridis*; from southern Mindanao by Fischer; and from Palawan by Griffin.† I regard it of rather doubtful occurrence in the Philippines.

TRIMERESURUS SCHULTZEI Griffin

PLATE 36

*Trimeresurus schultzei* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 601; § D 6 (1911) 267.

*Trimeresurus gramineus* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 600.

*Trimeresurus formosanus* BOULENGER, Ann. & Mag. Nat. Hist. VI 14 (1894) 85.

*Description of species.*—(From No. 614, Bureau of Science collection; collected at Iwahig, Palawan, May 27, 1908, by C. M. Weber.) (Adult female.) Head broadly triangular, rather rounding on canthus rostralis and about angles of jaws; snout rather blunt, short, the line of upper jaw very strongly curving upward from a point below eye; rostral perpendicular, distinctly broader than high, bordered behind by 3 scales, the 2 immediately

\* Cat. Snakes Brit. Mus. 3 (1896) 555 and 556.

† The specimen which Griffin has referred to this species belongs, I believe, to *Trimeresurus schultzei*.

above nasals largest; nasal longer than high, nostril pierced near center, and a small fold or semisuture to edge of scale above nostril; pit surrounded by second labial and 2 of the 3 preoculars; the 3 preoculars longer than high, the upper largest, all entering eye; supraoculars elongate, irregular on their inner side; 2 small postoculars and a long narrow subocular touching lowest preocular; scales in temporal region much larger than those on top of head; 10 upper labials (11 on right side), third in contact with subocular; a scale inserted between subocular and fourth labial; 2 scales between subocular and fifth labial; 13 lower labials, 3 touching chin shields which are elongate; these chin shields are followed by 4 paired scales; scales in 21 rows about body; median scales strongly keeled, outer slightly; anterior head scales smooth, enlarged; ventrals, 198, subcaudals, 66; tail prehensile; scales on head small, rounding, irregular, subimbricate, not keeled.

*Color in alcohol.*—Above, dark purplish brown with about 62 black, irregular, dim bars crossing back; top of head strongly reticulated with black lines; outer row of scales bright yellow; underpart of head muddy yellow with a darker spot under each jaw and darker areas on labials; a yellow line from eye to angle of mouth. Below, brownish to bluish lavender, the ventrals edged with black; tail dull flesh color with dim purplish mottlings laterally, and with no traces of bars.

*Measurements of Trimeresurus schultzei Griffin.*

|               | mm.   |
|---------------|-------|
| Total length  | 1,220 |
| Snout to vent | 1,022 |
| Tail          | 198   |

*Variation.*—The young are bright yellowish to bluish green, also barred with black; belly scales indistinctly edged with black; reticulations on head very distinct, sometimes forming a flower-shaped marking on occiput. In a specimen,\* 576 millimeters long, the color is brown. The outer row of scales is here spotted with a light purplish color.

*Remarks.*—I have taken an adult specimen for the description rather than the type which is at hand, since the latter is a very small, immature specimen.

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\* This specimen is recorded in the catalogue of the Bureau of Science collection as *T. gramineus*. Doctor Griffin reports it as the first occurrence of this species in the Philippines. I believe that it should be regarded as *T. schultzei*, as the two species differ in no essential particular. See Philip. Journ. Sci. § A 4 (1909) 600.

Griffin in his description has pointed out the differences between *T. gramineus* and the present species, but makes no mention of its relation with *T. sumatranus* Raffles, with which it has its closest affinity. Unfortunately no specimens of that species are at hand; but, judging from descriptions and also from the figure given by Lidth de Jeude, the following differences obtain:

In *Trimeresurus schultzei* the young are green with black bars laterally connected with a zigzag black line; the top of the head is very strongly reticulated with black; the head is short, the snout blunt; the scales of the outer row are entirely yellow, which color does not extend over either the second scale row or the ventrals; there are no lateral spots. In the adult the color becomes darker, the green apparently disappearing; the dark markings do not change.

TABLE 63.—Measurements and scale counts of *Trimeresurus schultzei* Griffin.

| No.  | Locality.            | Collector.       | Sex or age. | Length.<br>mm. | Tail.<br>mm. | Ventrals. | Subcaudals. |
|------|----------------------|------------------|-------------|----------------|--------------|-----------|-------------|
| *315 | Iwahig, Palawan..... | W. Schultze..... | yg          | 330            | 46           | 203       | 70          |
| 614  | do.....              | C. M. Weber..... | ♀           | 1,220          | 198          | 198       | 66          |
| 897  | do.....              | C. H. Lamb.....  | yg          | 386            | 65           | 193       | 75          |
| 898  | do.....              | do.....          | yg          | 425            | 76           | 193       | 75          |
| 1566 | Palawan.....         | Unknown.....     | ♀           | 576            | 82           | 196       | 68          |
| 5106 | Balabac.....         | C. M. Weber..... | yg          | 265            | 42           | 198       | 68          |
| 5107 | do.....              | do.....          | yg          | 360            | 65           | 193       | 78          |
| 5109 | do.....              | do.....          | yg          | 385            | 65           | 194       | 71          |

| No.  | Anal. | Upper labials. | Labials touch subocular. | Lower labials. | Labials touch chin shields. | Supraoculars. | Preoculars. | Postoculars. | Scales touch supraoculars. | Scale rows. | Collection.        |
|------|-------|----------------|--------------------------|----------------|-----------------------------|---------------|-------------|--------------|----------------------------|-------------|--------------------|
| *315 | 1     | 10             | 1                        | 11-12          | 3-4                         | 1             | 3           | 2            | 9                          | 23          | Bureau of Science. |
| 614  | 1     | 10-11          | 1                        | 13             | 3                           | 1             | 3           | 2            | 11                         | 21          | Do.                |
| 897  | 1     | 10             | 1                        | 11-12          | 3                           | 1             | 3           | 2            | 10                         | 21          | Do.                |
| 898  | 1     | 10             | 2                        | 12-13          | 4                           | 1             | 3           | 2            | 9                          | 23          | Do.                |
| 1566 | 1     | 10             | 1                        | 13             | 3                           | 1             | 3           | 2            | 9                          | 21          | E. H. Taylor.      |
| 5106 | 1     | 10-11          | 1                        | 13             | 3                           | 1             | 3           | 2            | 9                          | 21          | Do.                |
| 5107 | 1     | 8              | 1                        | 10             | 3                           | 1             | 3           | 2            | 9                          | 21          | Do.                |
| 5109 | 1     | 10-11          | 1                        | 13-14          | 3                           | 1             | 3           | 2            | 10                         | 21          | Do.                |

\* Type.

In *T. sumatranus* the white lateral line covers 2 half rows of scales, and the dorsal scales are only slightly keeled. In

*T. schultzei*, the ventrals range from 187 to 203 and average 196; the subcaudals range from 66 to 82 and average 71. The scales are in 21 to 23 rows, and those on the top of the head are flat and smaller than in *T. sumatranus*. There are 10 scales between supraoculars. In *T. sumatranus* the ventrals range from 180 to 191 and average 187; and the subcaudals range from 58 to 77 and average 68.

The species is found only in Palawan. If the specimen of *Trimeresurus formosanus* found in Palawan by Mr. Everett is referable to this form, as I strongly suspect, *Trimeresurus sumatranus* must of necessity be excluded from the Philippine fauna.

TRIMERESURUS PHILIPPENSIS Gray

PLATE 37, FIG. 1

*Trimeresurus philippensis* GRAY, Zool. Misc. (1842) 48; Cat. Vip. Snakes (1849) 10.

*Tropidolaemus hombroni* GUICHENOT, in Dumont d'Urville, Voy. Pôle Sud; PETERS, Mon. Berl. Ak. (1867) 29.

*Trimeresurus wagleri philippensis* GRAY, Zool., Rept. (1853) 23, pl. 2, fig. 2; DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1527.

*Description of species.*—(From an unnumbered specimen in the Santo Tomás Museum, Manila; locality and collector unknown.) Rostral higher than wide, visible above as a point; nasal rather large, longer than high, nostril pierced near center, appearing above as a mere line; 2 rather enlarged prefrontals forming a median suture; 3 scales bordering canthus rostralis in front of eye; supraocular enlarged, as long as, or longer than, diameter of eye; 7 scales between supraoculars; head scales very strongly keeled, erect, very rough in profile; pit surrounded by 1 large preocular which enters eye, a large loreal which is broken up below into one or two small divisions, and another small scale below preocular which does not enter eye; upper preocular enters eye; 8 upper labials, none entering pit or reaching suboculars, second and third largest, separated from subocular by a row of scales; temporals not enlarged; 8 lower labials, first pair minutely in contact behind mental; first pair of chin shields largest, longer than wide, followed by 3 pairs of smaller scales; scales in 19 rows on neck and on middle of body; ventrals, 132; anal single; subcaudals, 49; tail prehensile.

*Color.*—Above, greenish with 56 darker transverse bars composed of dark black background, each scale with a green center; these bars are two or three scales wide dorsally and extend about halfway down on side where they continue as a very thin zigzag line crossing ventral surface, but rarely meeting; bars

almost join each other on neck dorsally; they are more distinct on latter third of body, and merge into each other again on tail; darker scales on head edged with black; no streak behind eye, a suggestion of black around labials.

*Measurements of Trimeresurus philippensis Gray.*

|                     | mm. |
|---------------------|-----|
| Total length        | 450 |
| Length of head      | 22  |
| Diameter of eye     | 4   |
| Eye to end of snout | 8   |
| Head between eyes   | 14  |

*Remarks.*—Only this single specimen has been seen and, unfortunately, the locality is not known. The specimen is in the Santo Tomás Museum, Manila. This species is very probably identical with *Tropidolaemus hombroni* Guichenot from western Mindanao.

TRIMERESURUS WAGLERI (Boie)

*Cophias wagleri* BOIE, Isis (1827) 561.

*Trigonocephalus wagleri* SCHLEGEL, Phys. Serp. 2 (1837) 542, pl. 19, figs. 16–18.

*Trimeresurus maculatus* GRAY, Zool. Misc. (1842) 48; Cat. Vip. Snakes (1849) 8; MOTLEY and DILLWYN, Nat. Hist. Labuan (1855) 43.

*Trimeresurus subannulatus* GRAY, Zool. Misc. (1842) 48; Cat. Vip. Snakes (1849) 9; MOTLEY and DILLWYN, Nat. Hist. Labuan (1855) 44.

*Trimeresurus sumatranus* (non Raffles) GRAY, Zool. Misc. (1842) 48; Cat. Vip. Snakes (1849) 10.

*Trigonocephalus sumatranus* CANTOR, Cat. Mal. Rept. (1847) 121, pl. 40, fig. 9.

*Trimeresurus formosus* (non Schlegel) GRAY, Cat. Vip. Snakes (1842) 10.

*Tropidolaemus wagleri* DUMÉRIL and BIBRON, Erp. Gén. 7 (1854) 1524; F. MÜLLER, Verh. Nat. Ges. Basel 7 (1883) 290.

*Trigonocephalus hombroni* JAN, Rev. & Mag. Zool. (1859) 155.

*Tropidolaemus subannulatus* PETERS, Mon. Berl. Ak. (1861) 691.

*Tropidolaemus philippinensis* PETERS, Mon. Berl. Ak. (1861) 691.

*Trimeresurus wagleri* GÜNTHER, Rept. Brit. India (1864) 388; STOLICZKA, Journ. As. Soc. Bengal 42 (1873) 126; BLANFORD, Proc. Zool. Soc. London (1881) 224.

*Trimeresurus subannulatus immaculatus* PETERS, Ann. Mus. Genova 3 (1872) 42.

*Tropidolaemus subannulatus celebensis* PETERS, Mon. Berl. Ak. (1872) 584.

*Bothrops wagleri* F. MÜLLER, Verh. Nat. Ges. Basel 7 (1882) 155; DE JEUDE, Notes Leyden Mus. 8 (1886) 44.

*Tropidolaemus* (sp.) F. MÜLLER, Verh. Nat. Ges. Basel 8 (1887) 281.  
*Lachesis wagleri* BOULENGER, Cat. Snakes Brit. Mus. 3 (1896) 562.  
*Trimeresurus wagleri* GRIFFIN, Philip. Journ. Sci. § A 4 (1909) 601;  
 § D 6 (1911) 267.

Whether the Philippine specimens of *Trimeresurus wagleri* Boie (as understood in Boulenger's Catalogue) should be divided into further subspecies is a debatable question. Gray described two species, *Trimeresurus subannulatus* and *Trimeresurus philippensis*, from his Philippine material. Other writers have recognized certain of the forms as distinct species, others as subspecies; as a consequence we find *subannulatus*, *Tropidolaemus subannulatus* var. *maculatus*, and *T. philippinensis*, recorded by Peters \* from the Philippines, the first and last regarded as species, the other merely a variety of *subannulatus*. Boettger † in his list includes *hombroni*, *Trimeresurus philippinensis*, and *Trimeresurus wagleri*, placing the *Tropidolaemus subannulatus* and *Tropidolaemus maculatus* of Peters as synonyms of *Trimeresurus wagleri*. Boulenger ‡ has divided the species *Lachesis wagleri* into a series of varieties without naming them. The types of *Trimeresurus subannulatus* Gray, are relegated to the *Cophias wagleri* group; the specimens were from the Philippines, the exact locality unknown. In this same group are placed three specimens from Palawan, two from Mindanao, and three from Luzon.

The types of *Trimeresurus philippensis* Gray are placed in the group of *Tropidolaemus hombroni* Guichenot.

For an understanding of the Philippine fauna I regard it as essential that the varieties of *Trimeresurus wagleri* Boie which exist in the Philippines be recognized as subspecies. I have had at hand for study more than forty specimens; fifteen from Mindanao, sixteen from Palawan and Balabac, one from Negros, and eleven with localities uncertain. In this lot I am able to recognize three distinct variations, in at least two of which the differentiating characters hold throughout fairly large series of specimens. *Trimeresurus philippensis* of Gray is a distinct species.

*Key to the subspecies of Trimeresurus wagleri (Boie).*

♂. Ventrals, 139; subcaudals, 51; 12 scales between supraoculars; bars across body, 45 (average counts of 15 specimens); scales in 21 to 25 rows, keeled. Bluish green barred above with narrow stripes of white and dark blue, 2 scales wide; ventrals edged with black and

\* Mon. Berl Ak. (1861) 691.

† Ber. Senck. Nat. Ges. (1886) 120.

‡ Cat. Snakes Brit. Mus. 3 (1896) 562.

- with rather large spots of bluish or black; a white and blue bar behind eye; tail brownish red. Young green, or green with very small spots of white and blue, or with bars of white and brownish. Palawan and Balabac..... T. w. *wagleri* (Boie) (p. 298).
- $\alpha^2$ . Ventrals, 163; subcaudals, 50; 15 scales between supraoculars; scales, 23 rows, keeled, and slightly notched laterally. Bluish-green, with 23 very narrow white stripes, 1 scale wide, the color extending on the ventrals; light bluish green below; a white line from point of snout to angle of jaw; tail whitish on tip.
- T. w. *albovidis* Taylor (p. 299).
- $\alpha^1$ . Ventrals, 133; subcaudals, 45; 9 scales between eyes; head not narrowed in front as rapidly as in *wagleri*; labials usually in contact with subocular. Above bluish to yellowish green with a series of 34 bands of greenish white and grayish black, 2 or 3 scales wide; a few narrow black lines across ventrals; a line behind eye. Young, white; brownish stripes with brown spots usually present on head. Mindanao..... T. w. *subannulatus* (Gray) (p. 300).

### TRIMERESURUS WAGLERI WAGLERI (Boie)

#### PLATE 37, FIG. 4

*Cophias wagleri* BOIE, Isis (1827) 561.

It is highly probable that all references to *Trimeresurus wagleri* (Boie) as occurring in Palawan should be referred to this subspecies.

There is no necessity of a complete description of this subspecies; the following characteristics will enable one to distinguish the form.

Ventrals, 139; subcaudals, 51; scales between the supraoculars, 12; bars across body, 45 (these counts are the averages of fifteen specimens from Palawan and Balabac.) The scale rows vary between 21 and 25.

The coloration is usually bluish green barred above with narrow stripes of white and dark blue, 2 scales wide. Ventrals edged with black and with rather large spots of bluish or black; a white and blue bar behind eye. Tail brownish red.

In young specimens the entire color above is green, or green with a very few white and blue spots. Occasional specimens show bars of white and brownish.

The species agrees in size and general color with the subspecies *T. wagleri subannulatus* Gray. It is not a rare snake in either Palawan or Balabac. It probably does not occur anywhere in the Philippines save in the Palawan group and the Calamianes.

## TRIMERESURUS WAGLERI ALBOVIRIDIS Taylor

## PLATE 37, FIG. 2

*Trimeresurus wagleri alboviridis* TAYLOR, Philip. Journ. Sci. § D  
12 (1917) 366.

*Description of subspecies*.—(From the type, No. 432, E. H. Taylor collection; collected in Isabela, Occidental Negros, September 12, 1915, by E. H. Taylor.) (Young female.) Head triangular, very distinct from neck, nearly one and a half times as long as wide; rostral about as wide as high, not visible from above, bordered behind by 2 enlarged internasals; latter narrowly in contact, being nearly separated by 3 small scales; nasal bordered above by internasal, 2 supranasals, and a postnasal folded over canthus rostralis, the dorsal part much larger than the lateral; nasal large, longer than wide, nostril pierced near anterior margin, bordered behind by postnasal and a number of small intercalated scales, 7 or 8 in number, completely separating nasal from loreal, and loreal from first labials; pit surrounded by median preocular and 2 loreals; anterior loreal much larger than posterior, in contact with second labial and 1 supralabial; 3 preoculars, the middle largest, the lower very small; 2 small subequal postoculars; a narrow, crescentic, elongate subocular, separated from labials by a series of supralabials; supraocular region covered by 4 enlarged scales, the supraocular somewhat longer than wide; this is bordered by another scale along its inner side, nearly as large; a third somewhat smaller scale joins these behind, and a fourth borders them in front; supraocular and the scale in front in contact with superior preocular; temporals subequal, about 4 lateral rows; upper labials 11 (10 on right side), third and fourth largest, first and second subequal in size; 12 lower labials, only 1 in contact with anterior pair of chin shields; latter large, followed by 3 smaller pairs; head scales above strongly keeled, 14 to 15 rows between supraocular scales; scales in 23 rows, faintly keeled, with a slight notch indicated on each side of scales; ventrals, 163; subcaudals, 50; anal entire.

*Color in life*.—Above bluish green, growing yellowish green laterally and greenish white below; body crossed with 26 very narrow white lines, not continuing ventrally; tail barred laterally with narrow white and blackish lines; point of tail whitish; a slight line behind eye to angle of jaw, top of head more blue than green, side of head lighter green with no markings.

*Measurements of Trimeresurus wagleri alboviridis* Taylor.

|               | mm. |
|---------------|-----|
| Total length  | 370 |
| Snout to vent | 308 |
| Tail          | 62  |

*Remarks.*—This form differs from all other subspecies of *Trimeresurus wagleri* in the very much higher average number of ventrals (29 more than the average, 24 more than any recorded Philippine form, and 10 more than any specimen reported in Boulenger's catalogue). The upper head scales are smaller, there being 5 or 6 more between the supraoculars than in other subspecies. The small lateral notches in the scales are distinctive. I captured the type in the low mountains of Negros, in small bushes. This is the only specimen known.

## TRIMERESURUS WAGLERI SUBANNULATUS (Gray)

## PLATE 37, FIG. 3

*Trimeresurus subannulatus* GRAY, Zool. Misc. (1842) 48; Cat. Vip. Snakes (1849) 9.

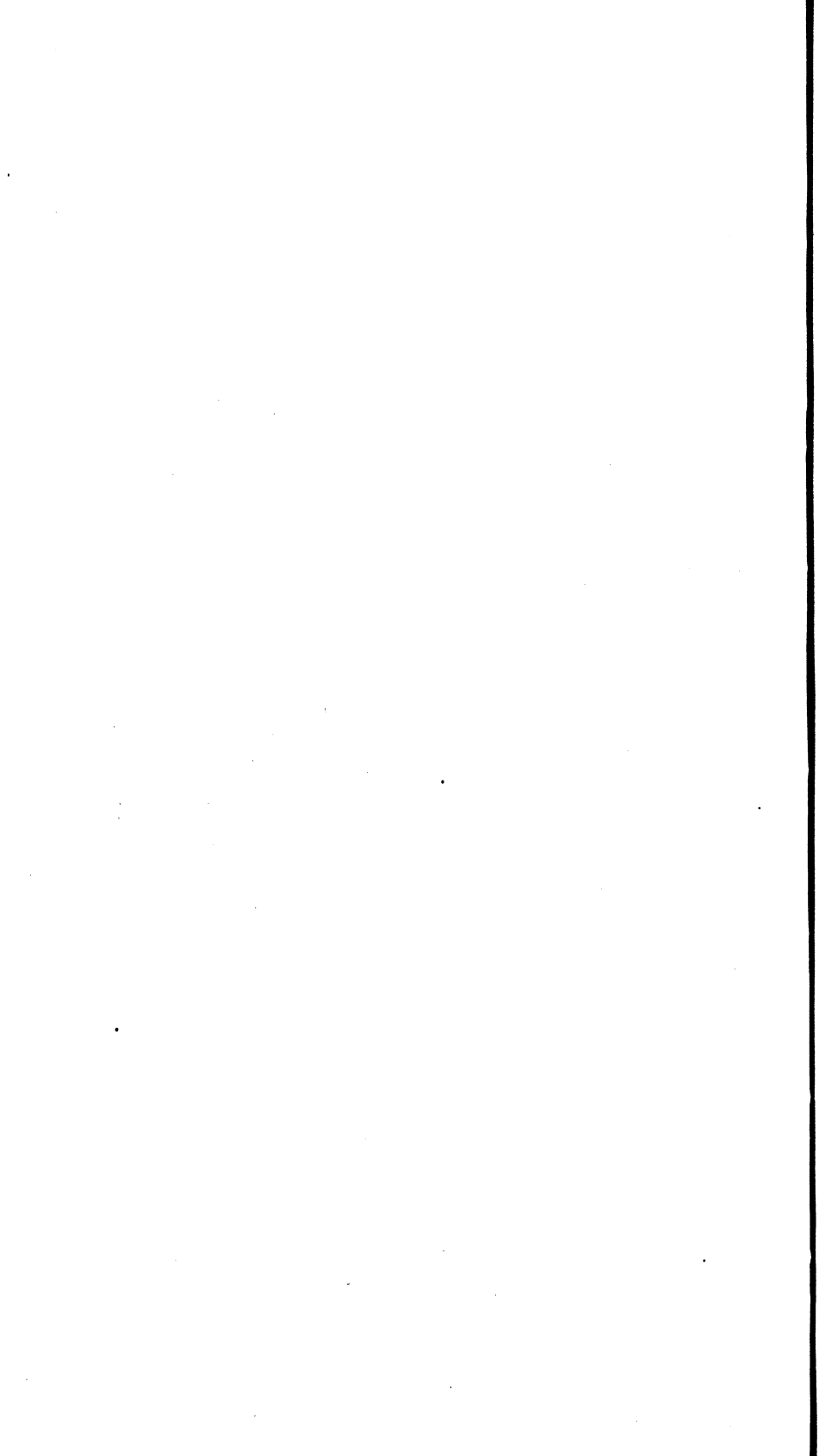
*Description of subspecies.*—Head very distinct from body, very broad, nearly as broad as long; snout short, rather broadened, with a prominent canthus rostralis; eye small; rostral a little higher than wide, visible from above as a mere line; bordered above by 2 rounding scales, forming a suture medially; nasal large, the nostril pierced near the middle of the scale which is bounded above by 3 small, rounding scales, subequal in size; these scales are without keels, including the 2 touching rostral; a large postnasal folded over canthus rostralis, its superior part longest; behind nasal, the loreal and a minute intercalated scale below touch the first labial; anterior loreal large, narrowly in contact with nasal, forming the anterior border of facial pit, in contact with first 2 labials; posterior border of pit bounded by second preocular and second small loreal; 3 preoculars, the median largest, the inferior very small; supraocular longer than diameter of eye, its inner margin irregular, in contact with superior pre- and postoculars; 2 small postoculars; a narrow, curved, elongate subocular borders eye behind and below, separated from labials by a series of small supralabials of unequal size; 2 small scales between third labial and loreals; 9 upper labials, third, fourth, and first largest in the order named; edges of labials bordering mouth form a wavy line; 10 lower labials; mental wider than rostral, about as deep; 1 large pair of chin shields followed by 3 smaller paired scales; 2 labials in contact with first pair of chin shields; temporals numerous, 4 or 5 lateral

rows, those bordering labials largest; head scales on snout larger than those between eyes, all strongly keeled save those that border canthus rostralis; scales between supraoculars 9 or 10; from last lower labials to first ventral, 9 rows of scales; scales on chin and throat large, wider than deep; scales on body in 23 rows, all keeled; outer row largest; pupil vertical; ventrals, 131; anal entire; subcaudals, 43.

*Color in life.*—Dorsally a bright bluish green, with yellowish green to yellow laterally and ventrally; a series of bands on body, (21 on body, 13 on tail); these bands are composed of a greenish yellow stripe bordered by a black line of varying width; some of the bands are broken in the middle; below they connect with a narrow black line crossing ventrals; usually 1 or 2 black lines between ends of bars ventrally; ventrals are of varying shades of yellow to cream, all with a tinge of green; ventral lines are black; tail pinkish, the black bands not connected above or below; top of head variously spotted with black; a yellowish line runs from nasal through eye, and around angle of jaw; behind eye this is bordered below by a black band which continues the same distance; upper and lower labials yellow-green, some edged with black. Length, 655 millimeters; tail, 102.

*Variation.*—In this form the chief variation is between the young and the adult. The black color is usually wanting and is usually replaced by brown or brown and lavender; the head is sometimes spotted, sometimes not. The number of upper labials is almost constantly 9, with usually 10 lower labials; ventrals average 134; subcaudals, 45.

*Remarks.*—Common in Mindanao. These snakes were usually found in small trees in the forest. Their coloration makes them very difficult to discern. They are deadly poisonous.



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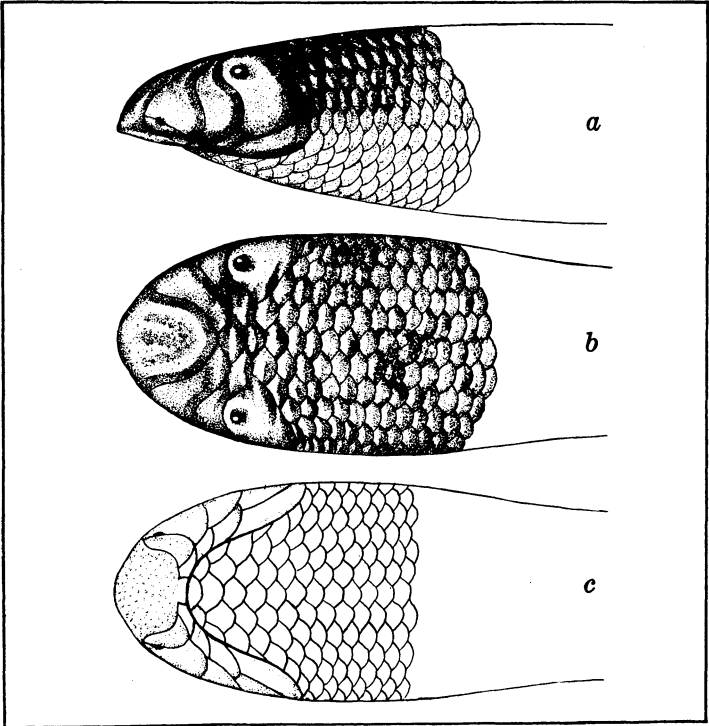


PLATE 1. TYPHLOPS LONGICAUDA TAYLOR.





PLATE 2. XENOPELTIS UNICOLOR REINWARDT.



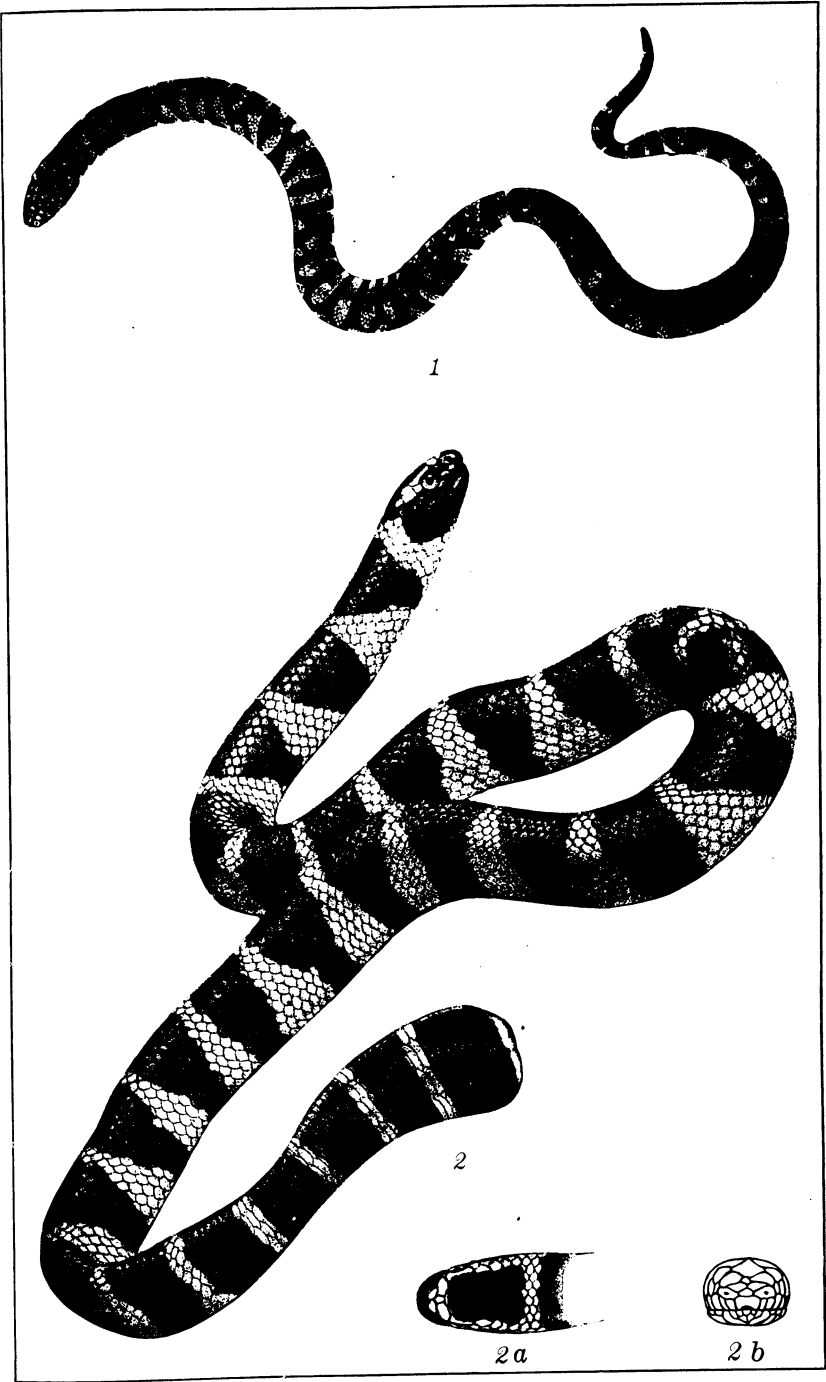


PLATE 3. PHILIPPINE SNAKES.



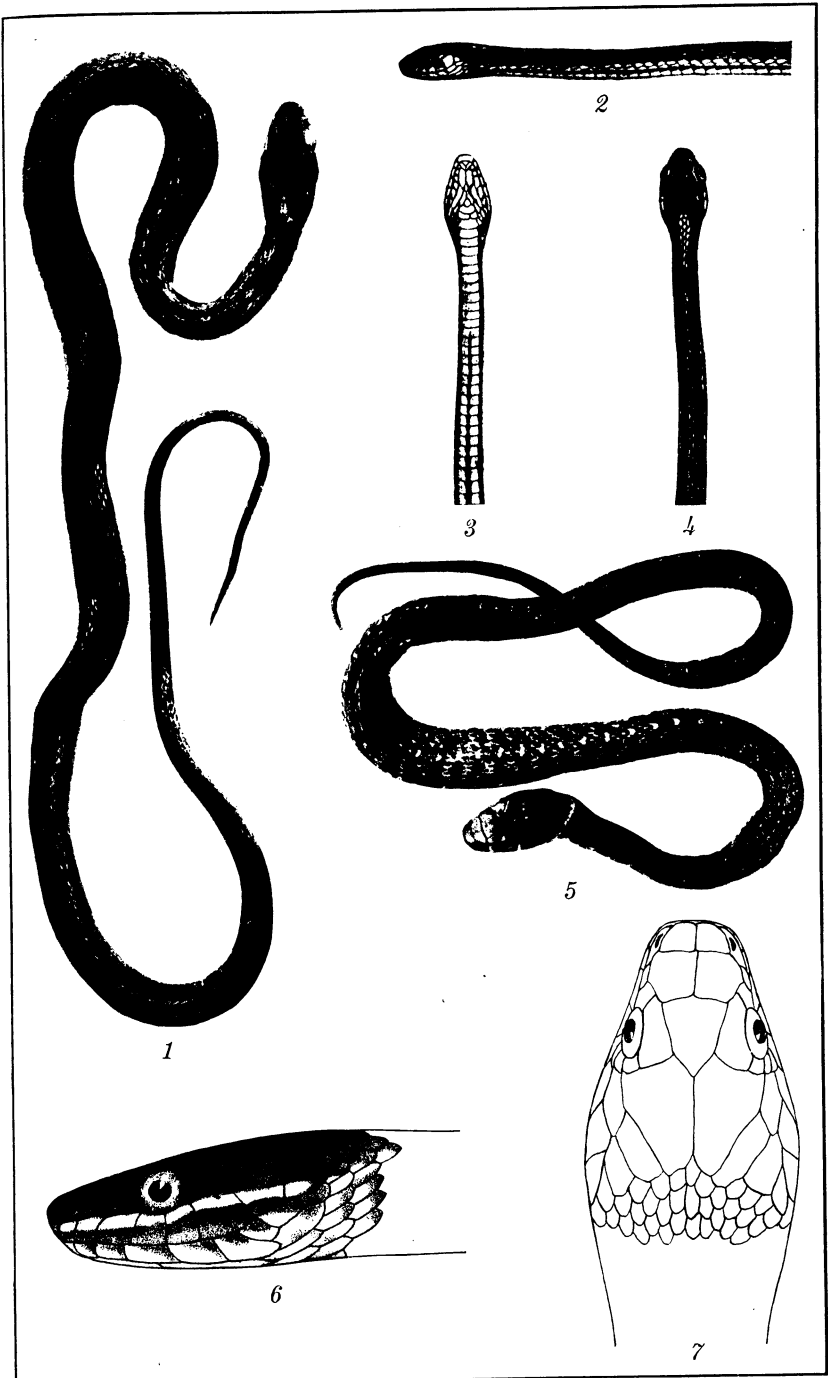


PLATE 4. PHILIPPINE SPECIES OF NATRIX.



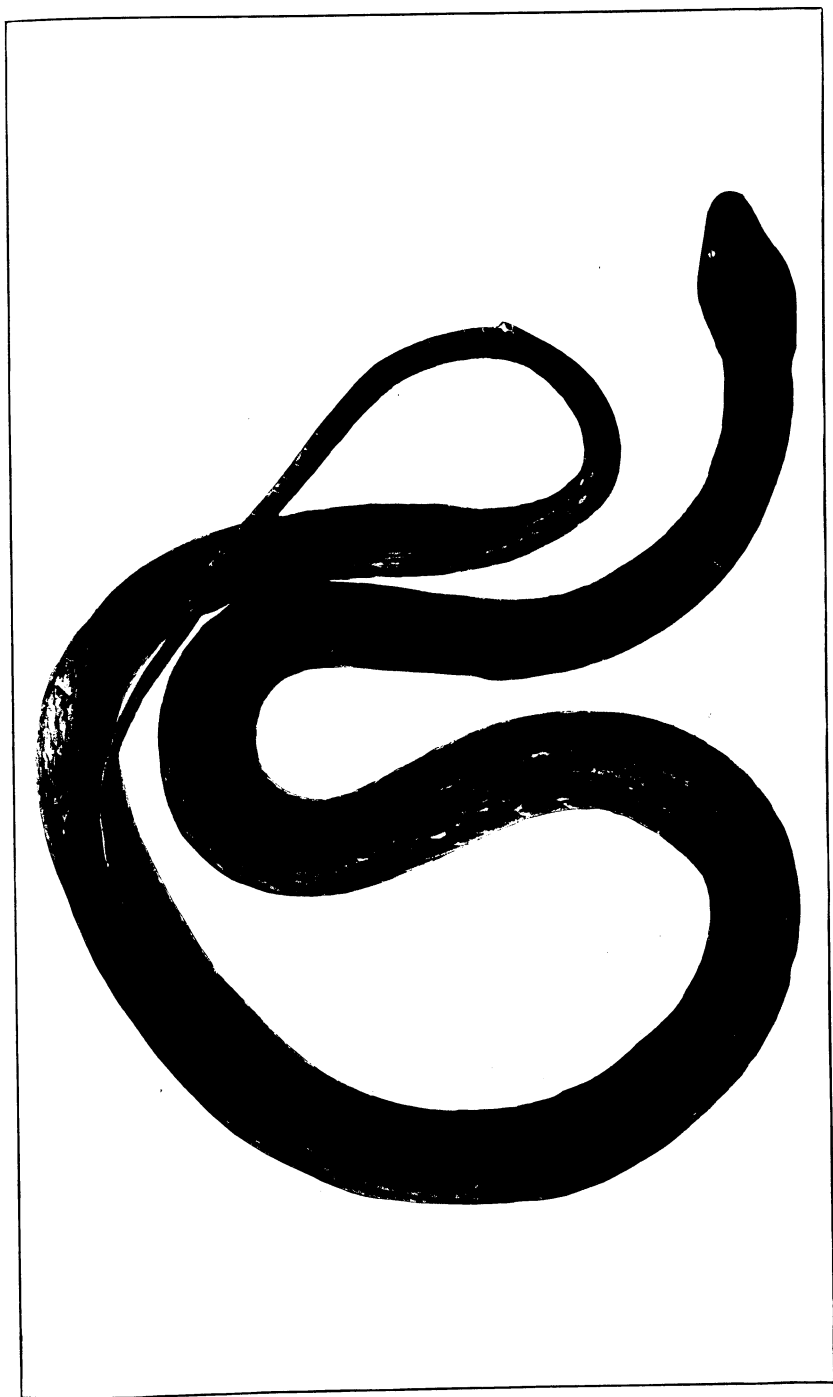


PLATE 5. NATRIX LINEATA (PETERS).



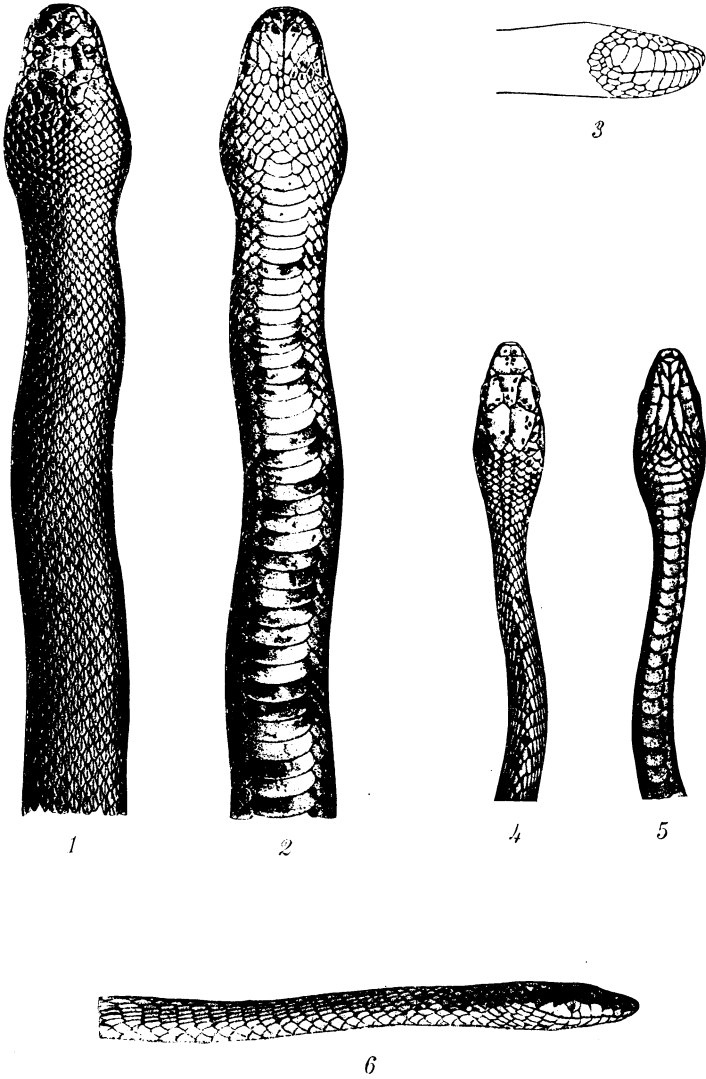
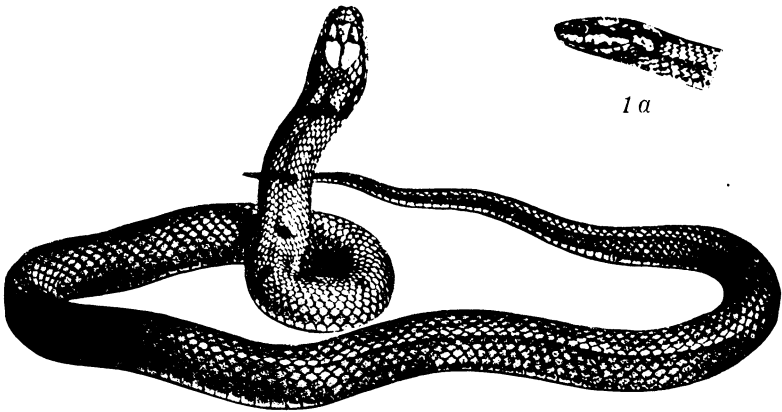
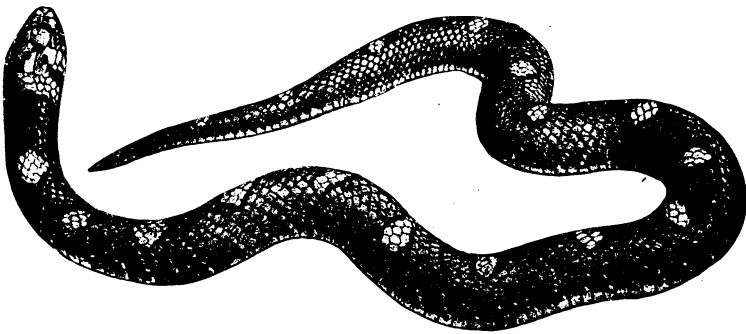


PLATE 6. PHILIPPINE SNAKES.





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PLATE 7. PHILIPPINE SNAKES.



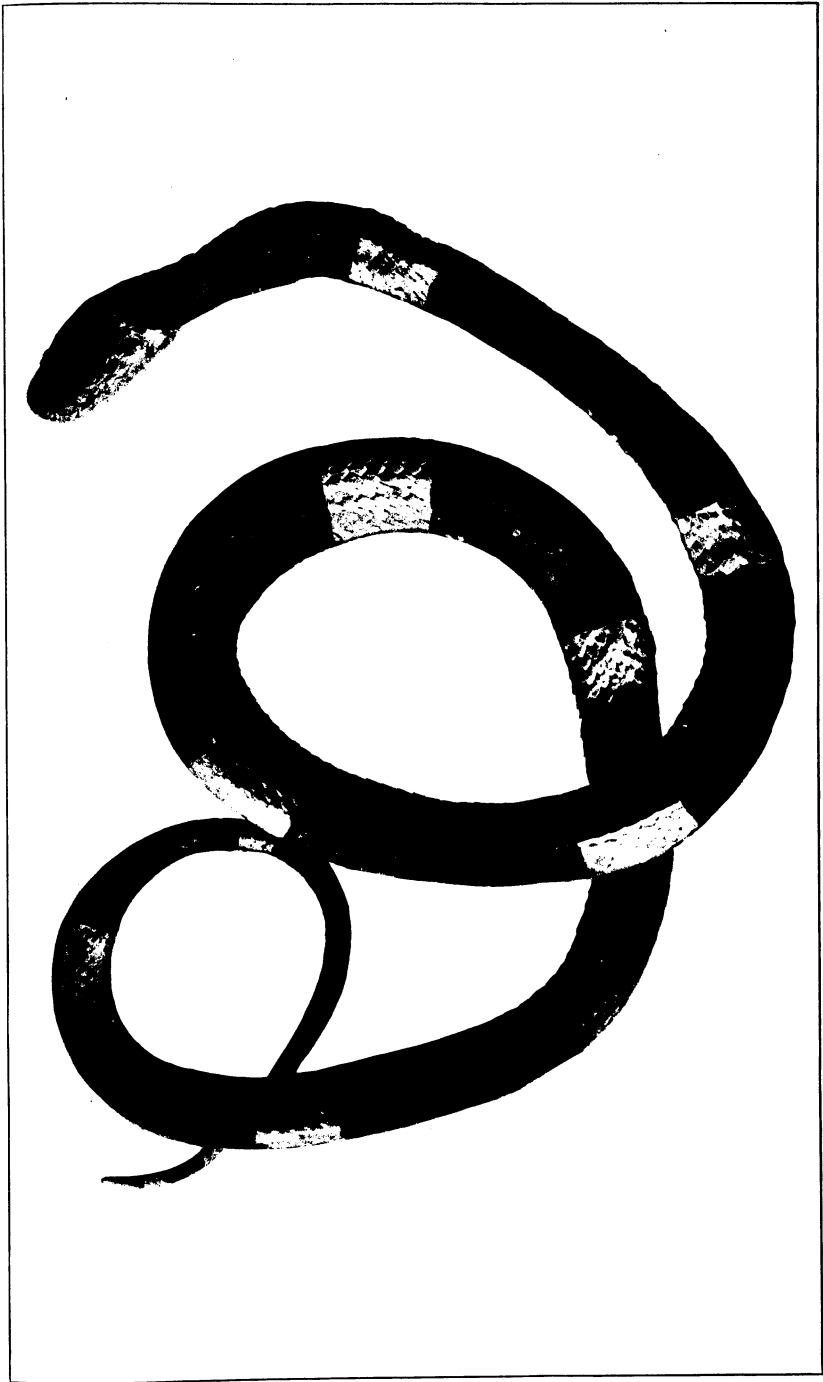


PLATE 8. OPHITES SUBCINCTUS (BOIE).



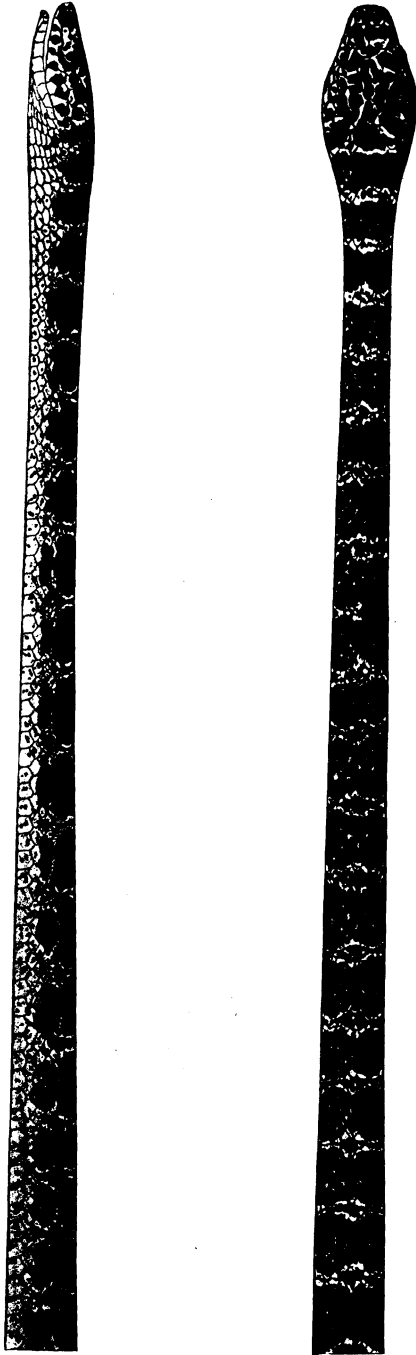


PLATE 9. HAPLONODON PHILIPPINENSIS GRIFFIN.



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22  
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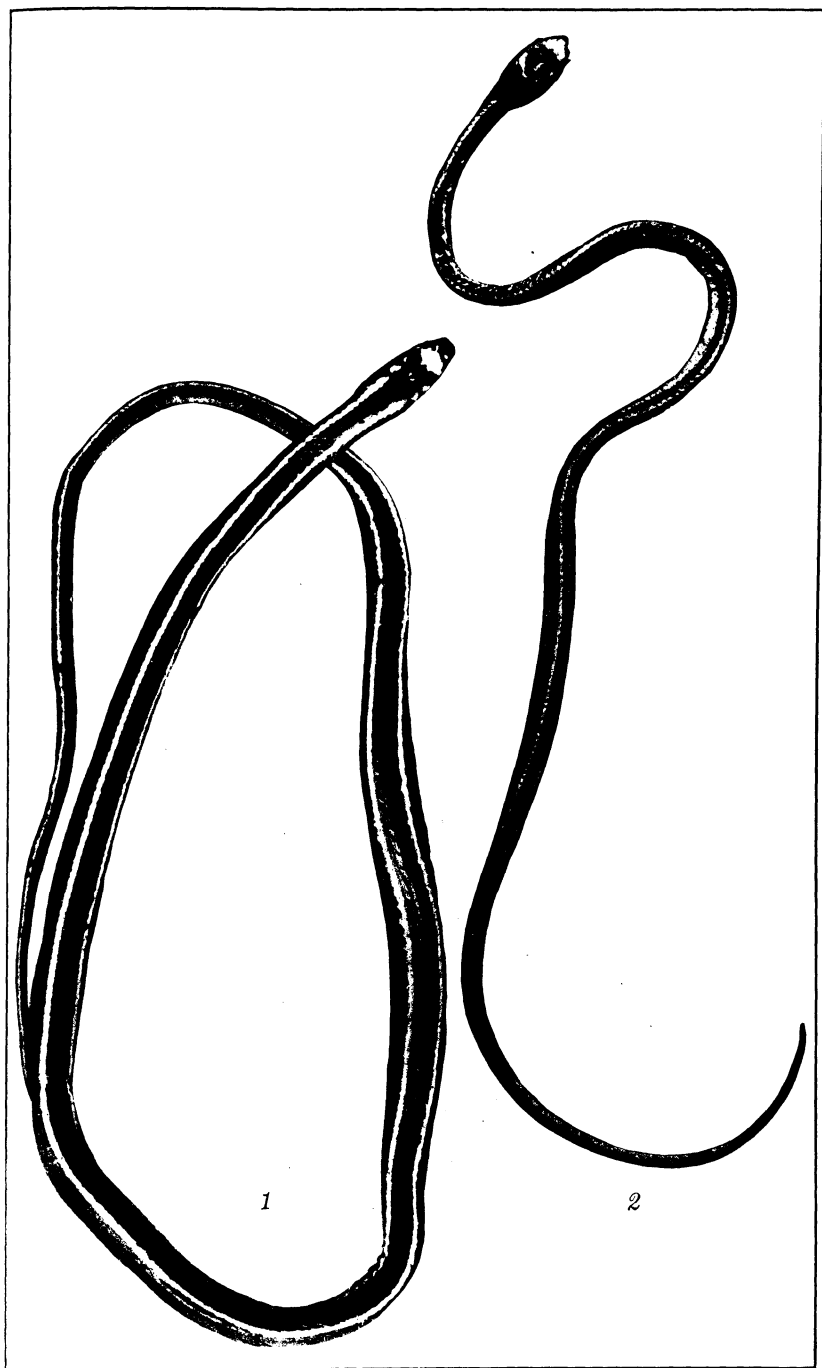


PLATE 10. PHILIPPINE SNAKES.



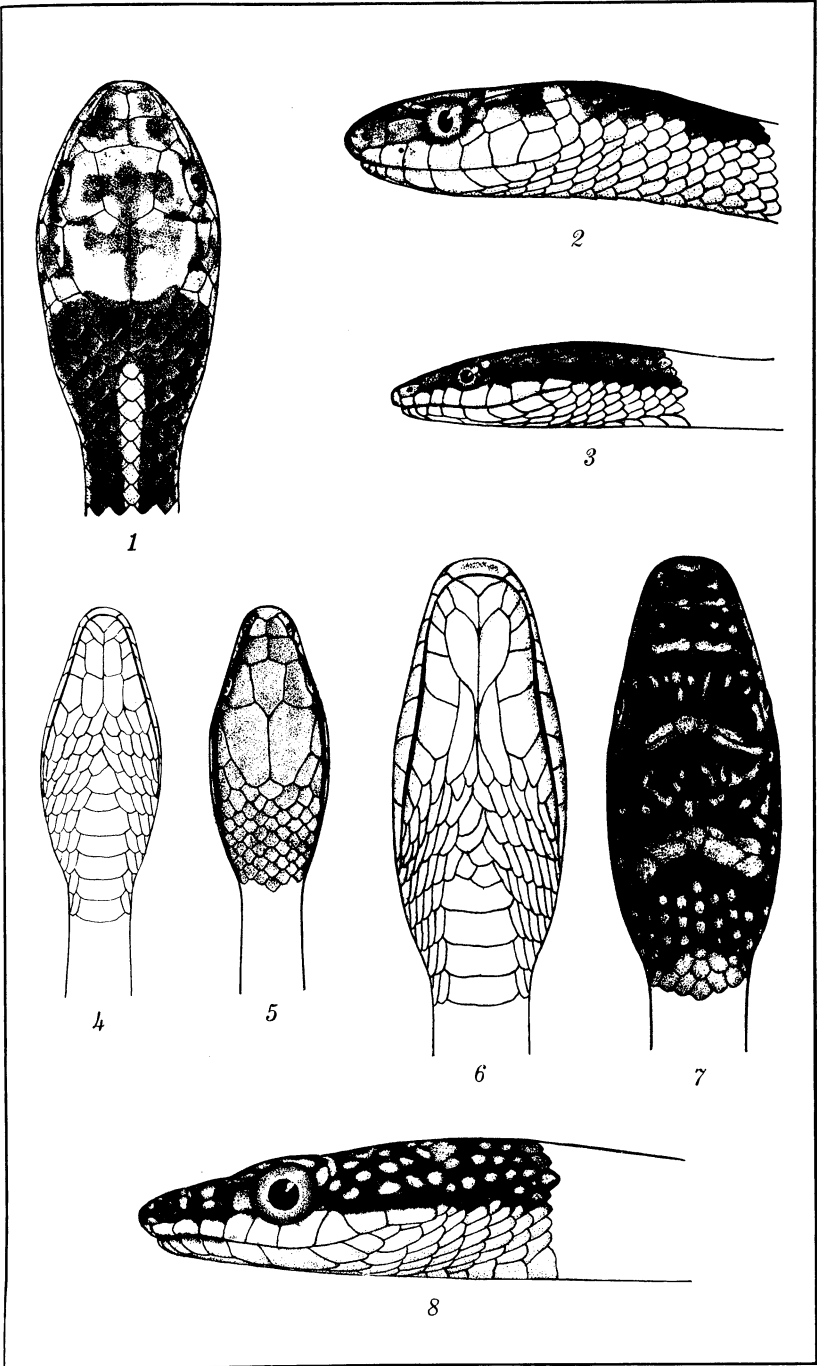


PLATE 11. PHILIPPINE SNAKES.





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PLATE 12. PHILIPPINE SPECIES OF ZAOCYS.



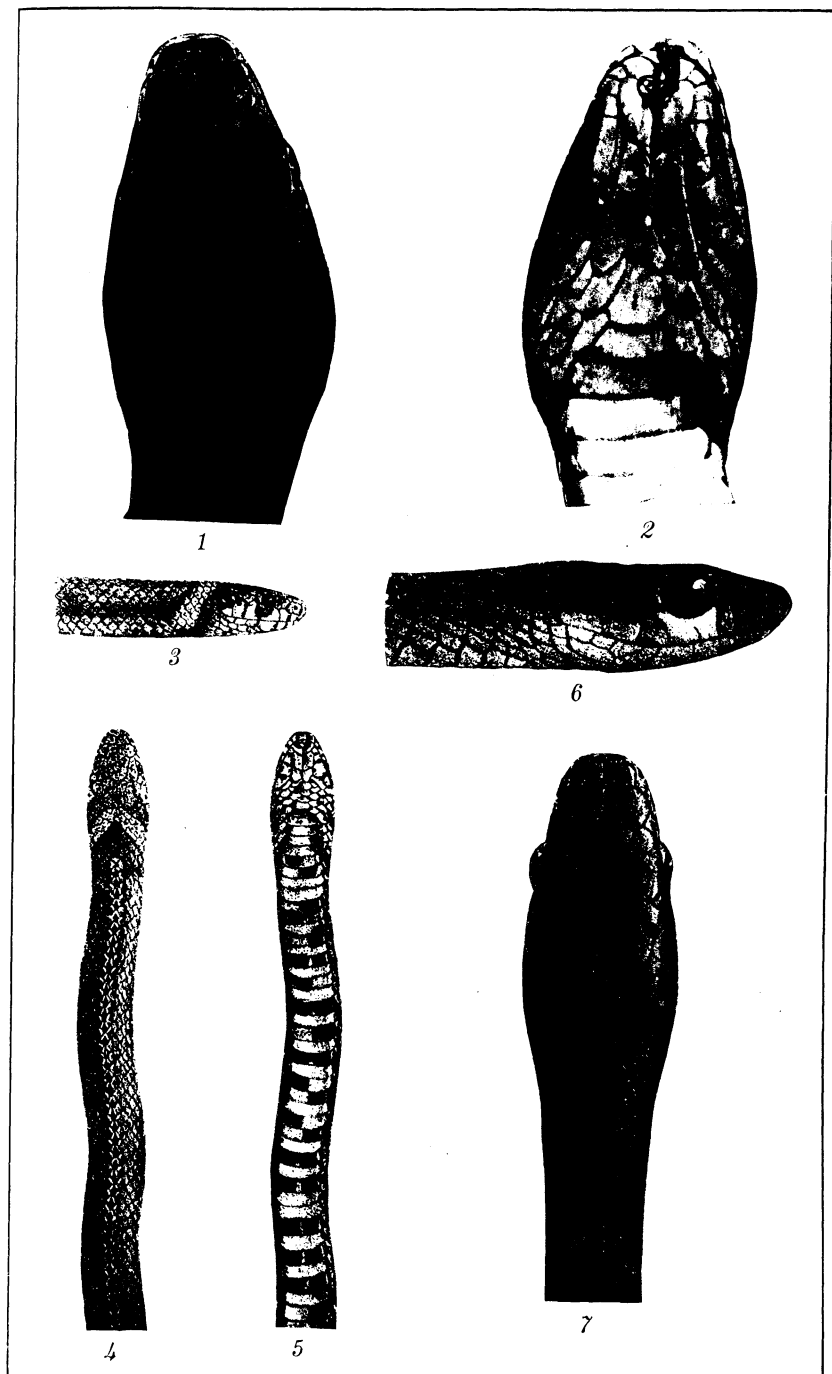


PLATE 13. PHILIPPINE SNAKES.



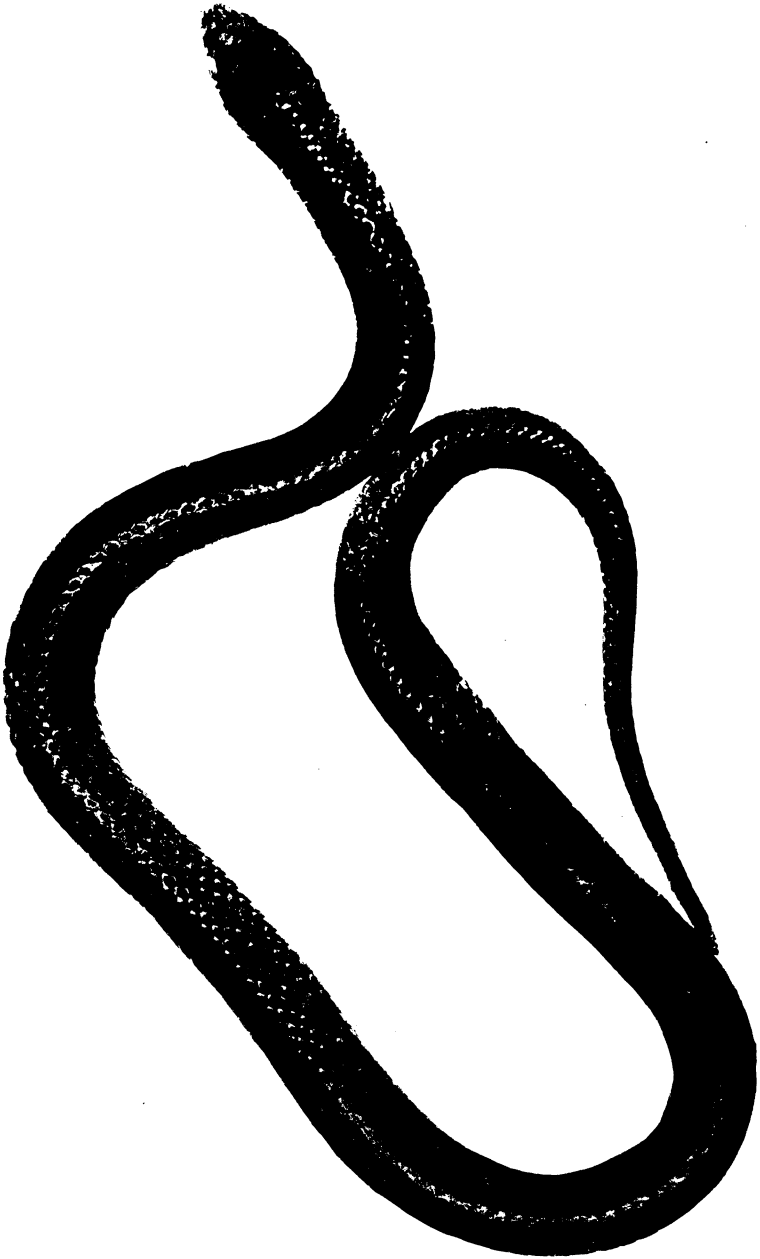


PLATE 14. *HOLARCHUS MEYERINKII* (STEINDACHNER).



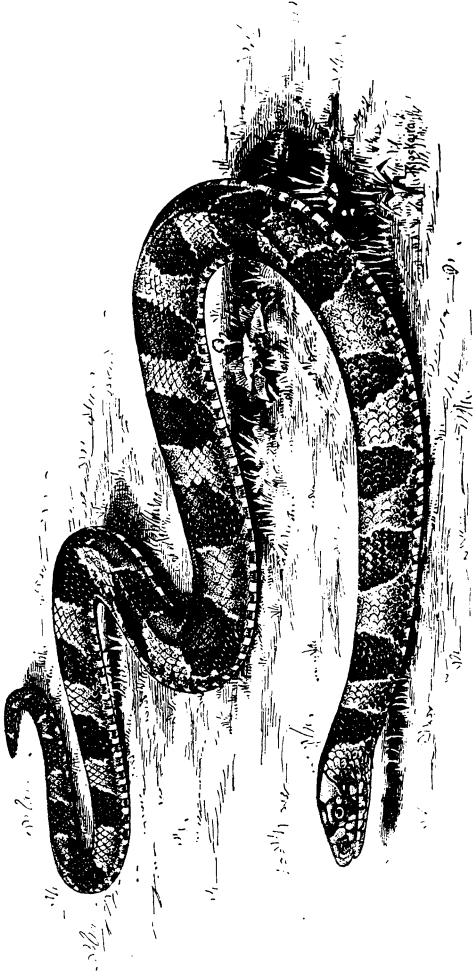
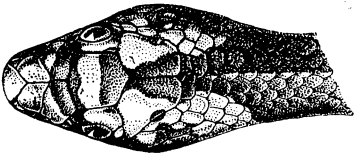


PLATE 15. HOLARCHUS MACULATUS TAYLOR.



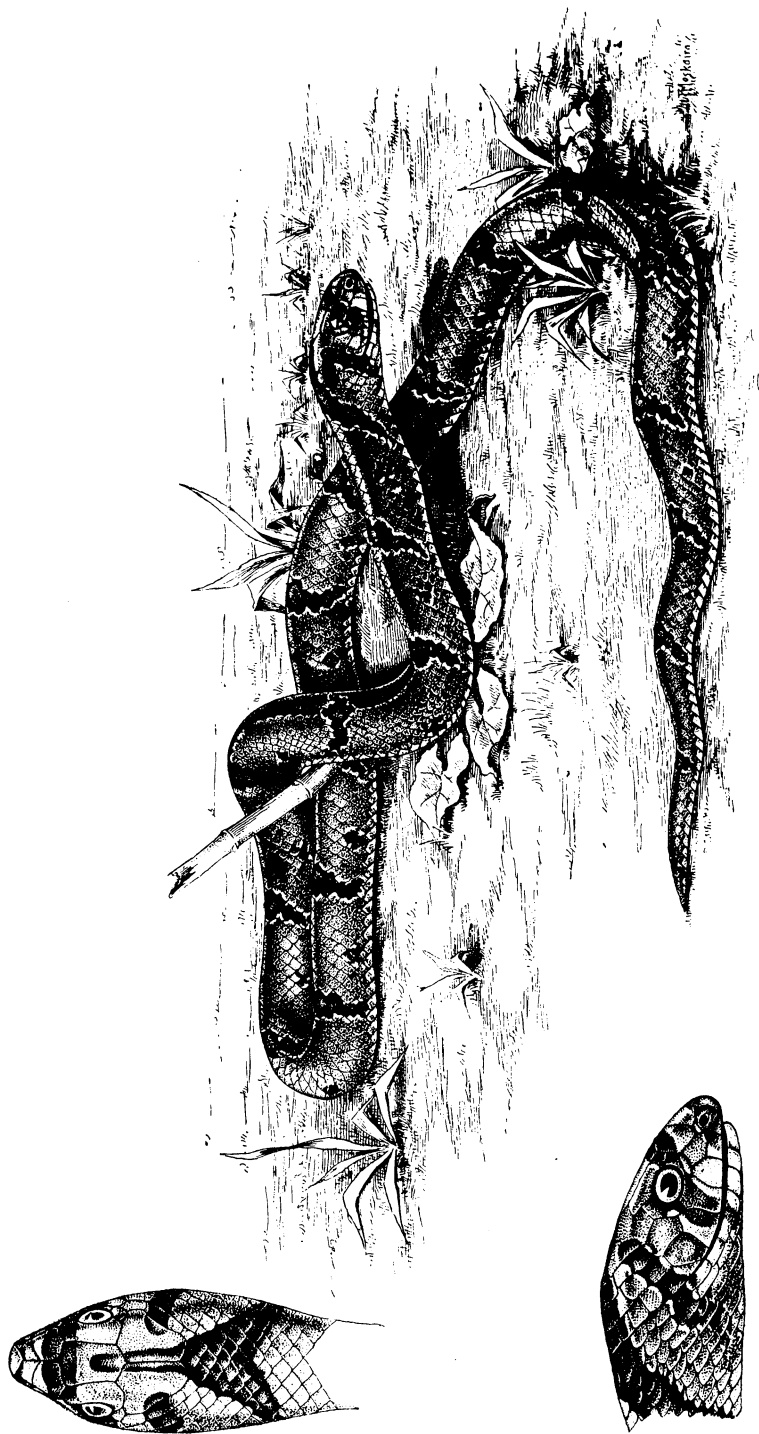
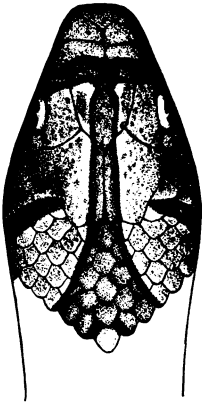


PLATE 16. HOLARCHUS BURKSI TAYLOR.

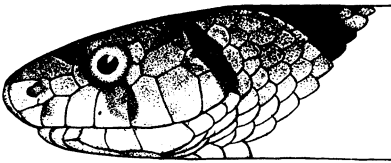




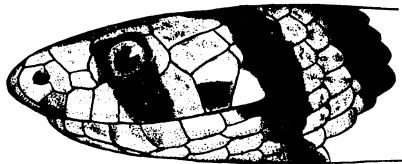
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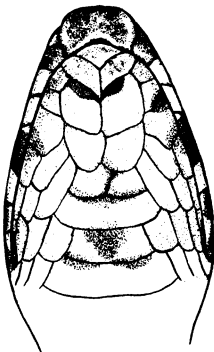
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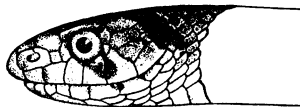
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PLATE 17. PHILIPPINE SNAKES.



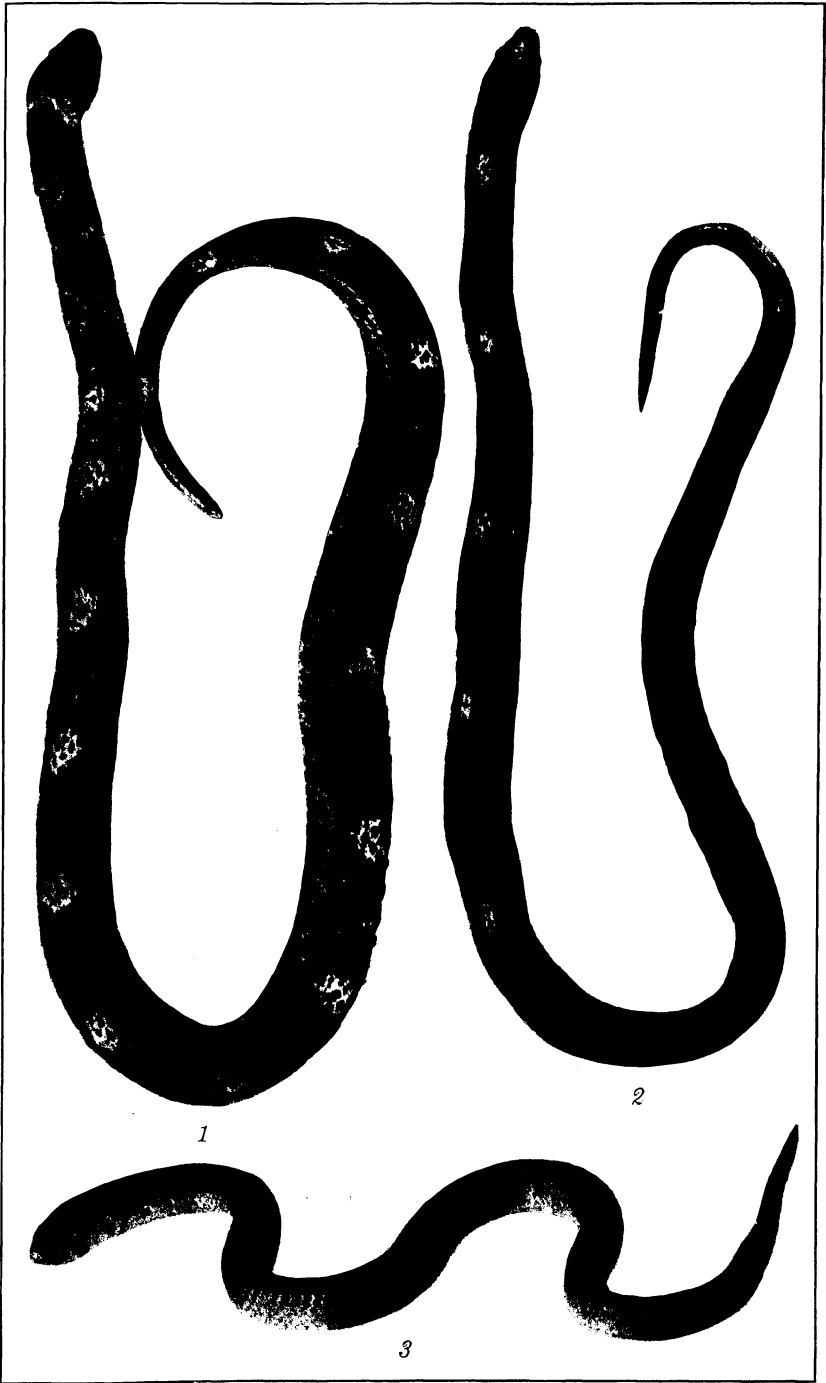


PLATE 18. PHILIPPINE SNAKES.



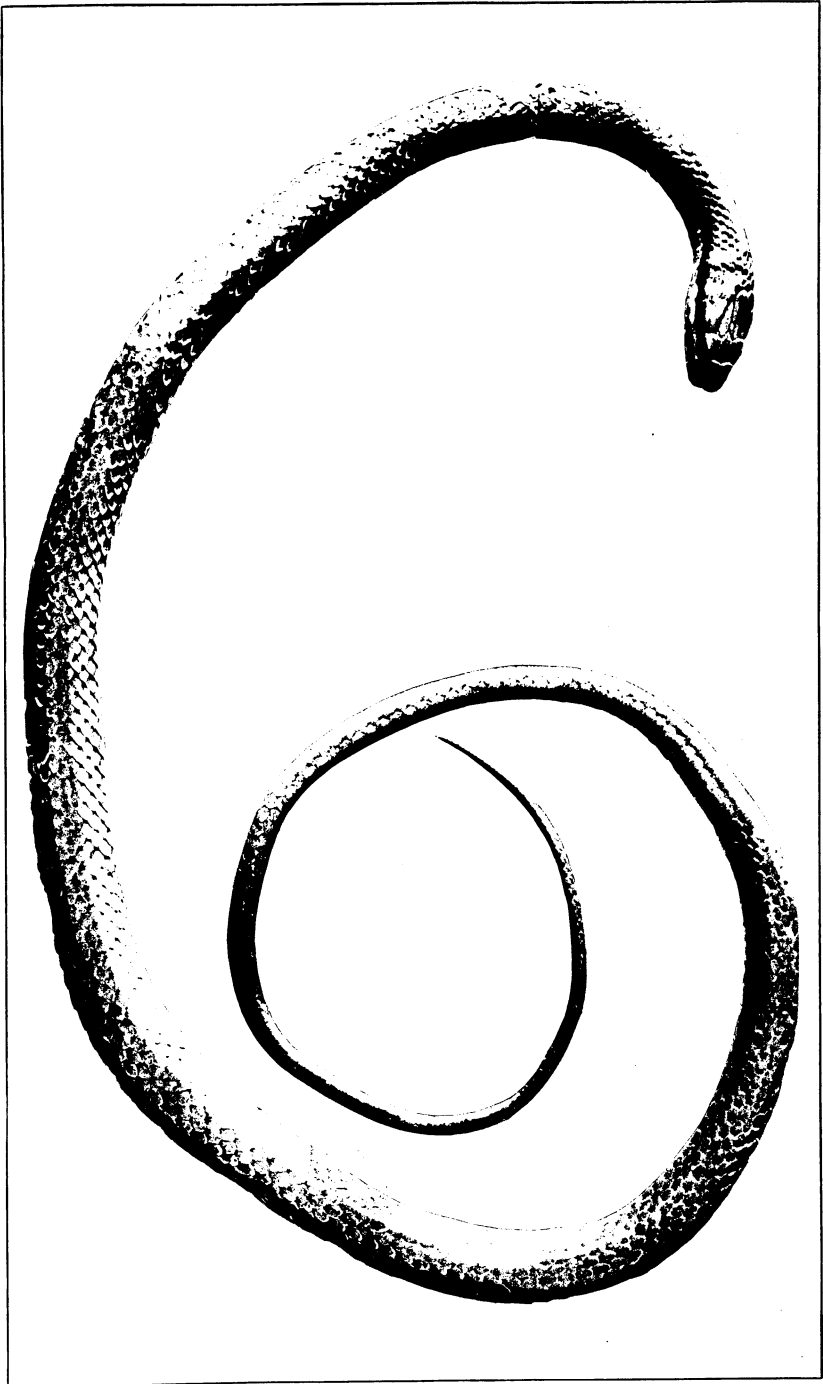


PLATE 19. LIOPELTIS TRICOLOR (SCHLEGEL).



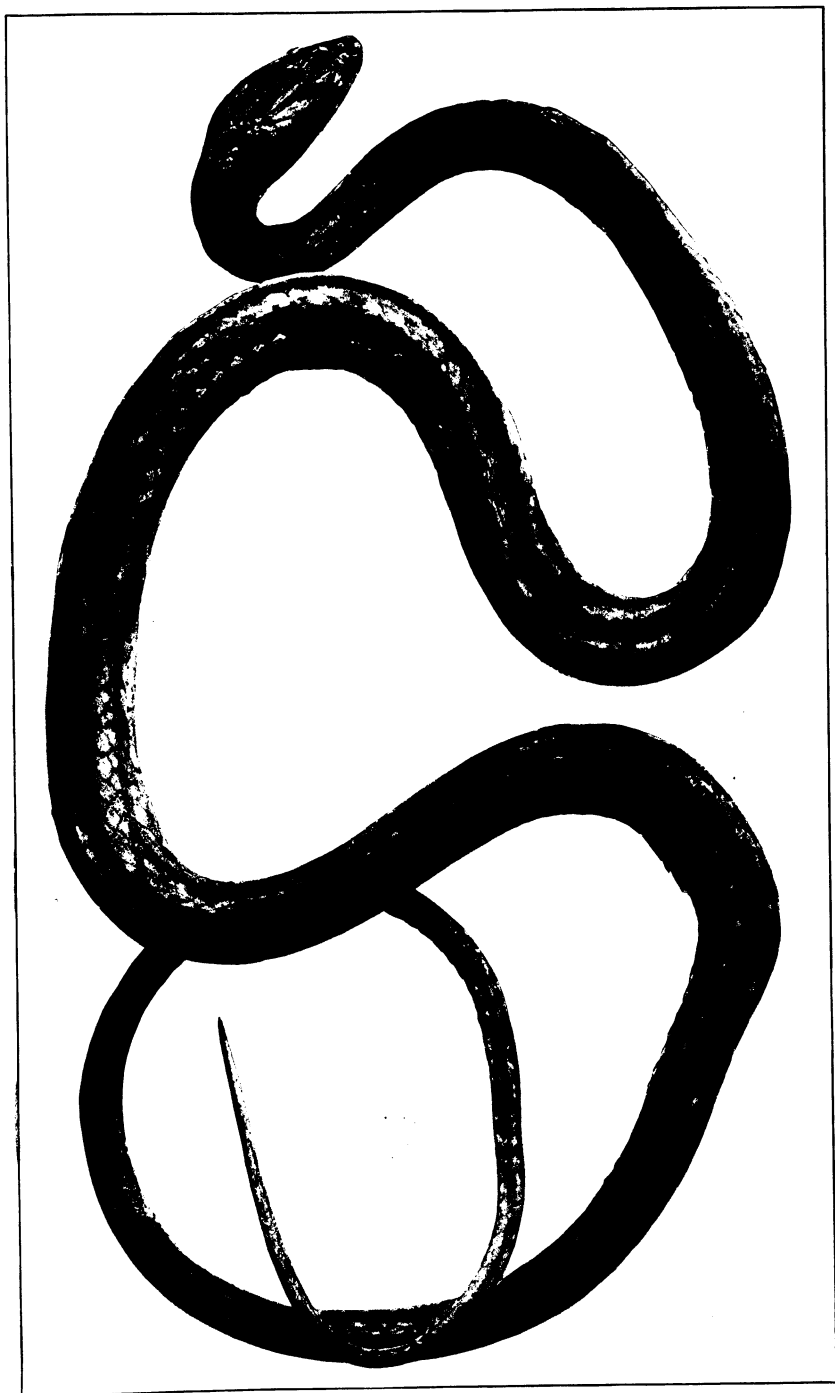


PLATE 20. *LIOPELTIS PHILIPPINUS* (BOETTGER).



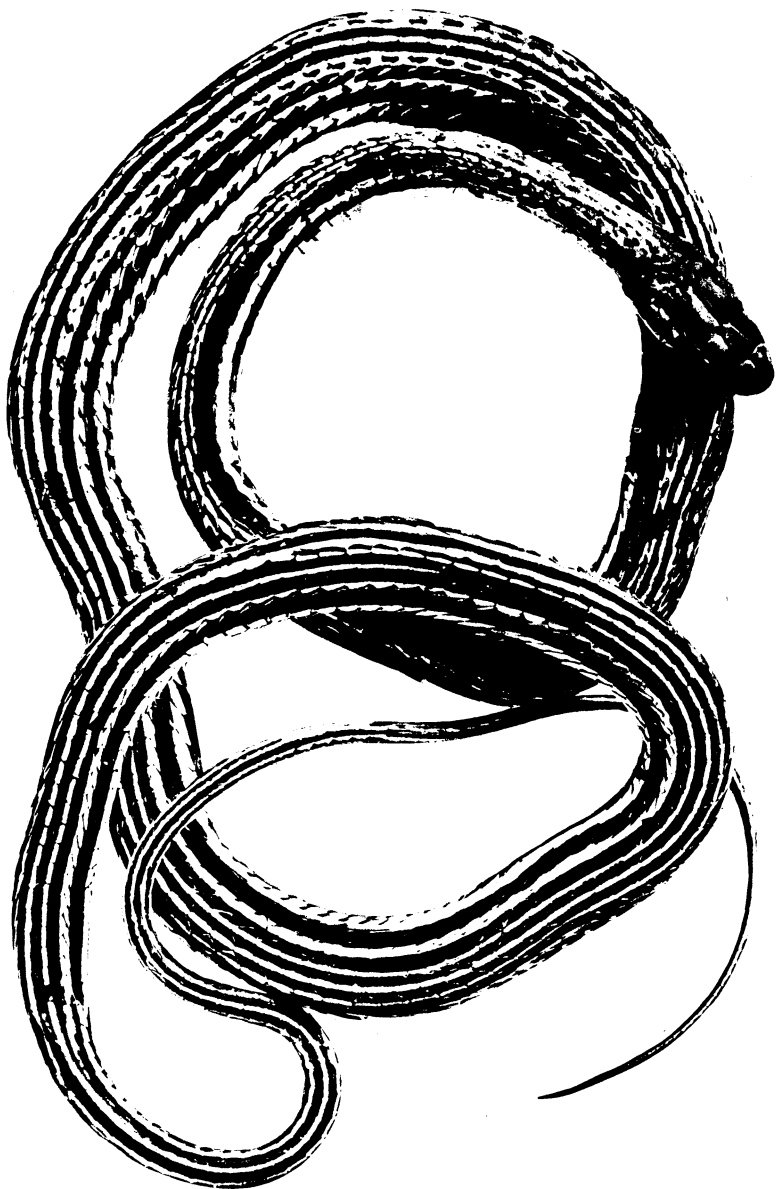


PLATE 21. DENDRELAPHIS CAUDOLINEATUS (GRAY).



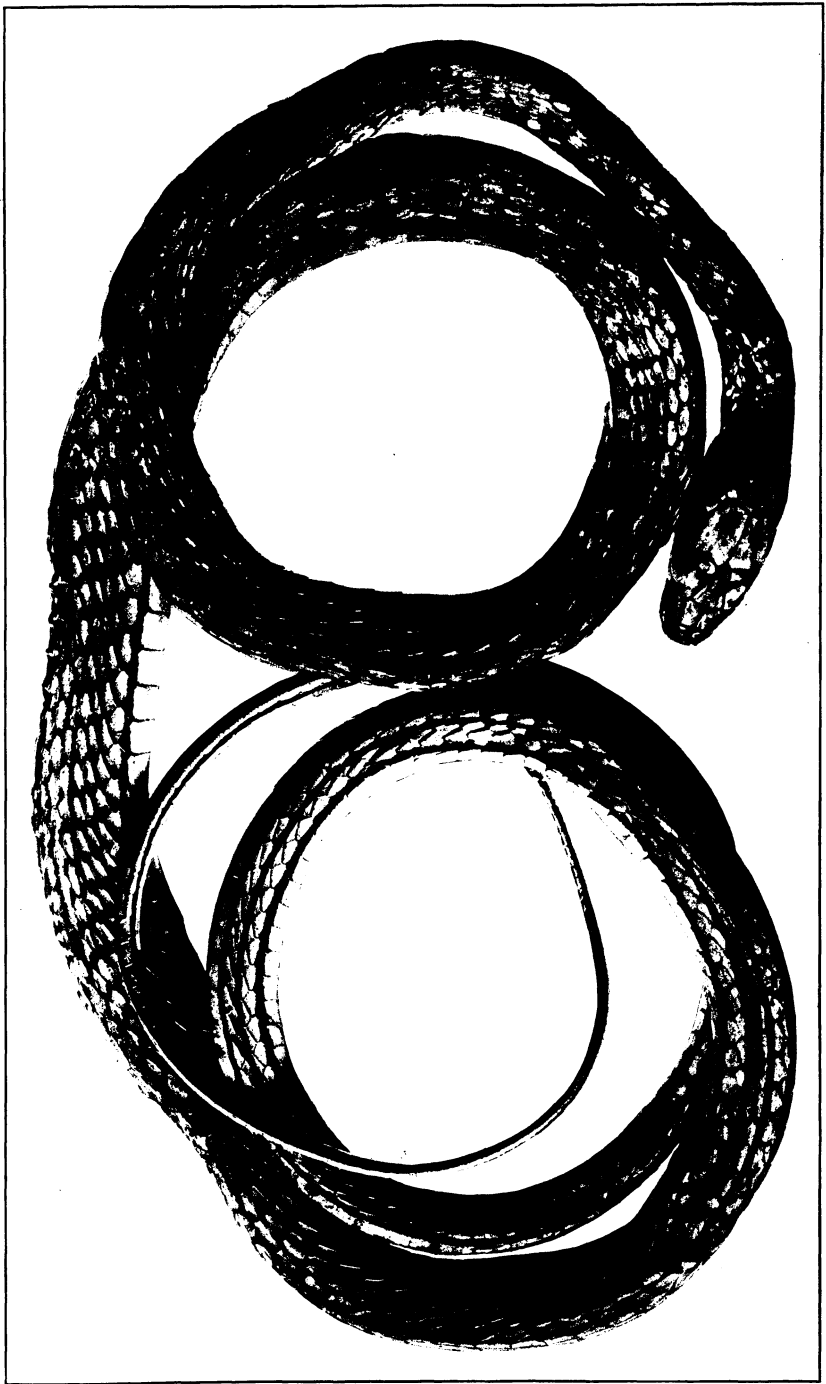


PLATE 22. DENDRELAPHIS TERRIFICUS (PETERS).



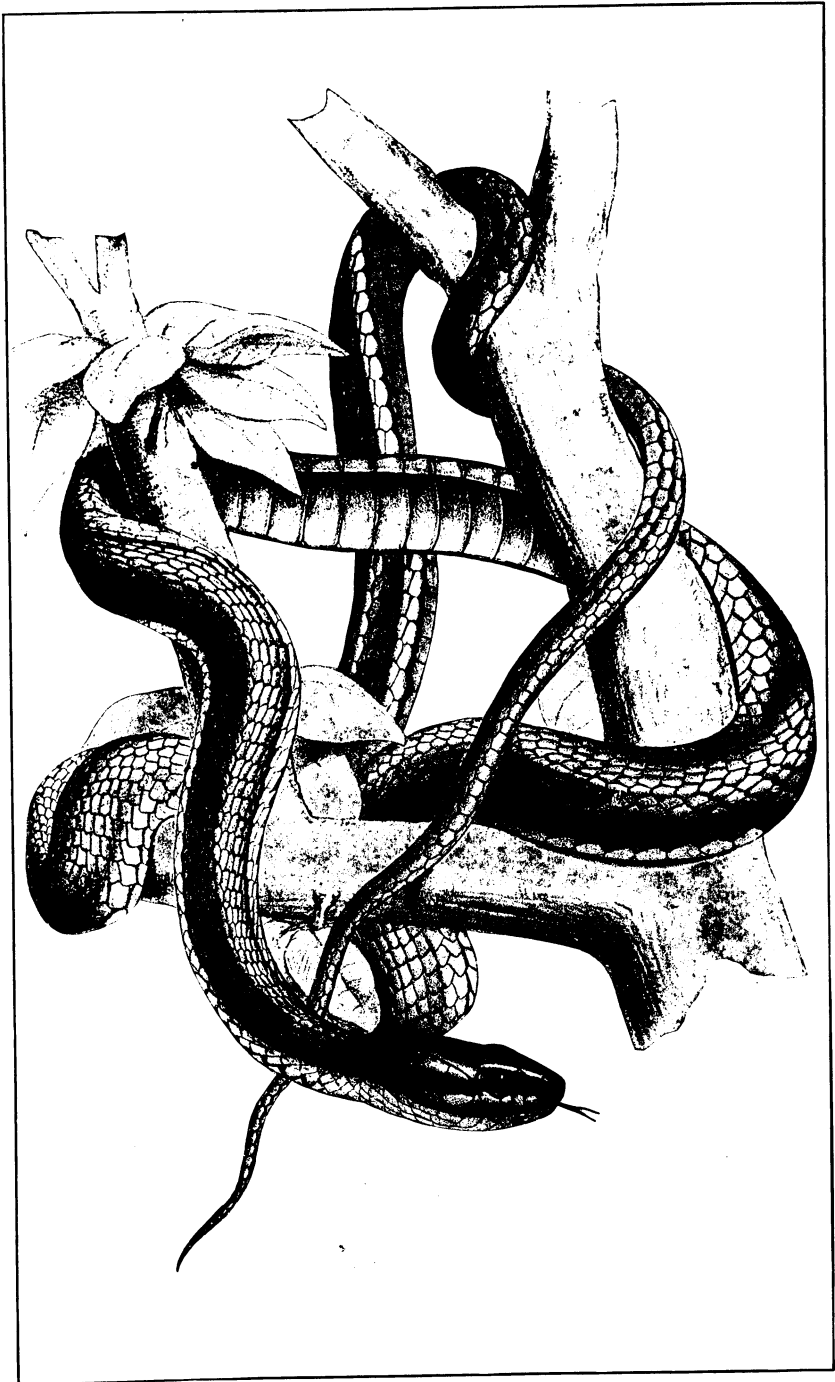


PLATE 23. DENDRELAPHIS TERRIFICUS (PETERS).



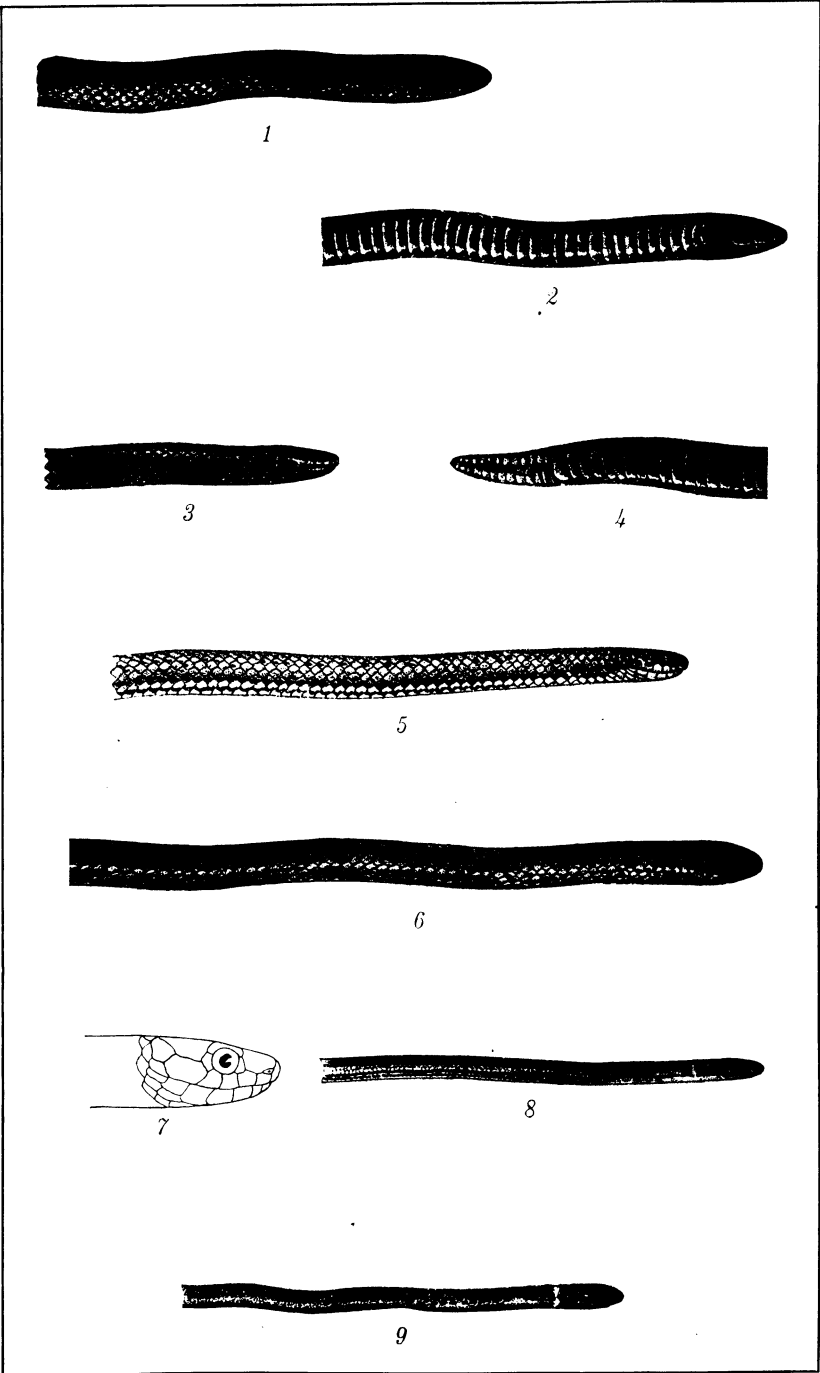


PLATE 24. PHILIPPINE SNAKES.



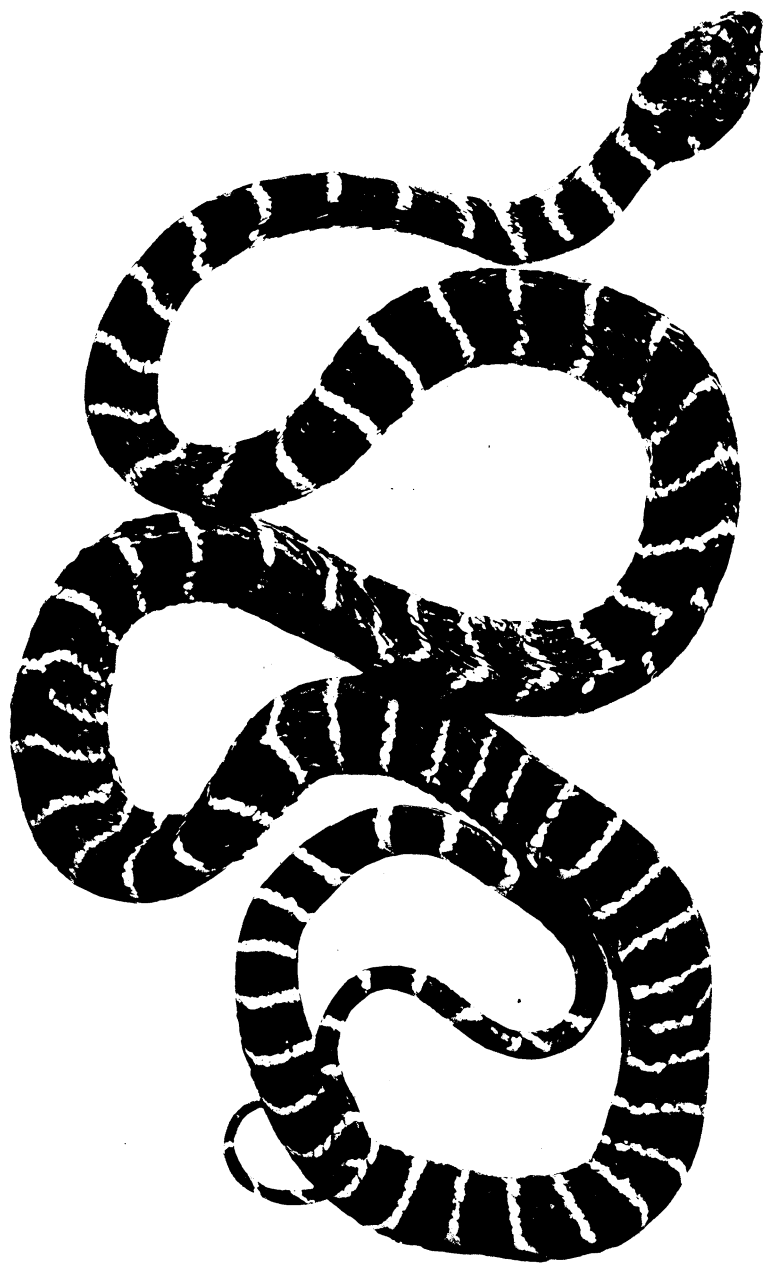
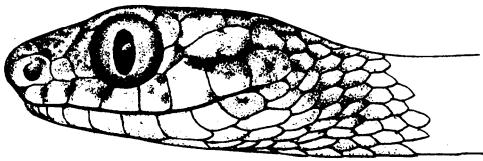
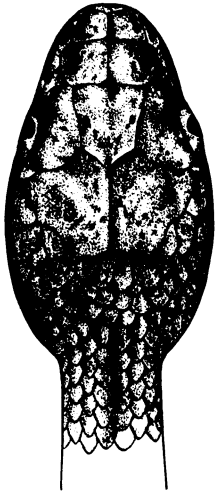


PLATE 25. BOIGA DENDROPHILA MULTICINCTA (BOULENGER).

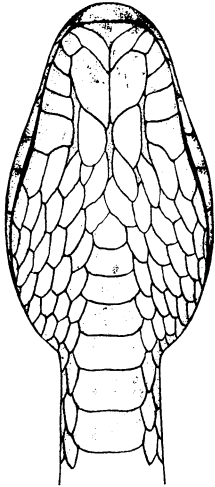




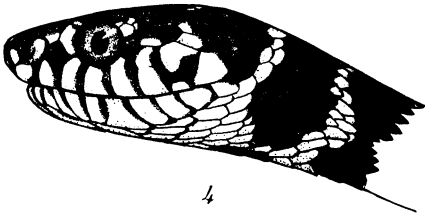
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PLATE 26. PHILIPPINE SPECIES OF BOIGA.



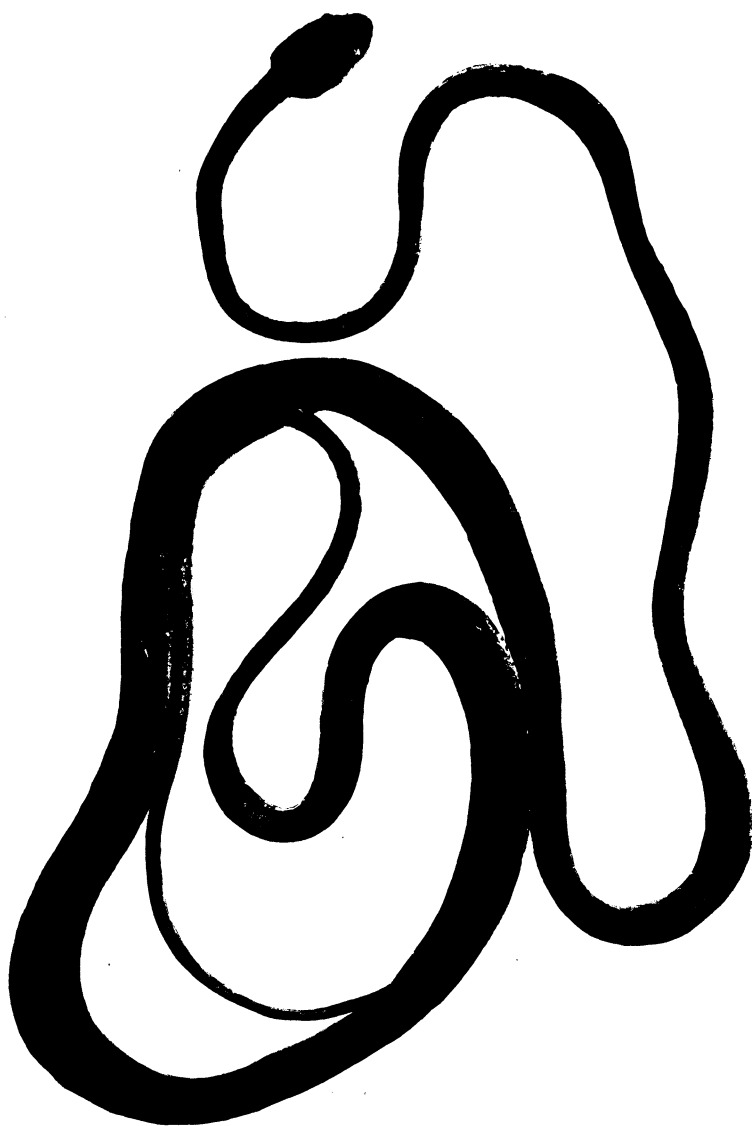


PLATE 27. BOIGA ANGULATA (PETERS).



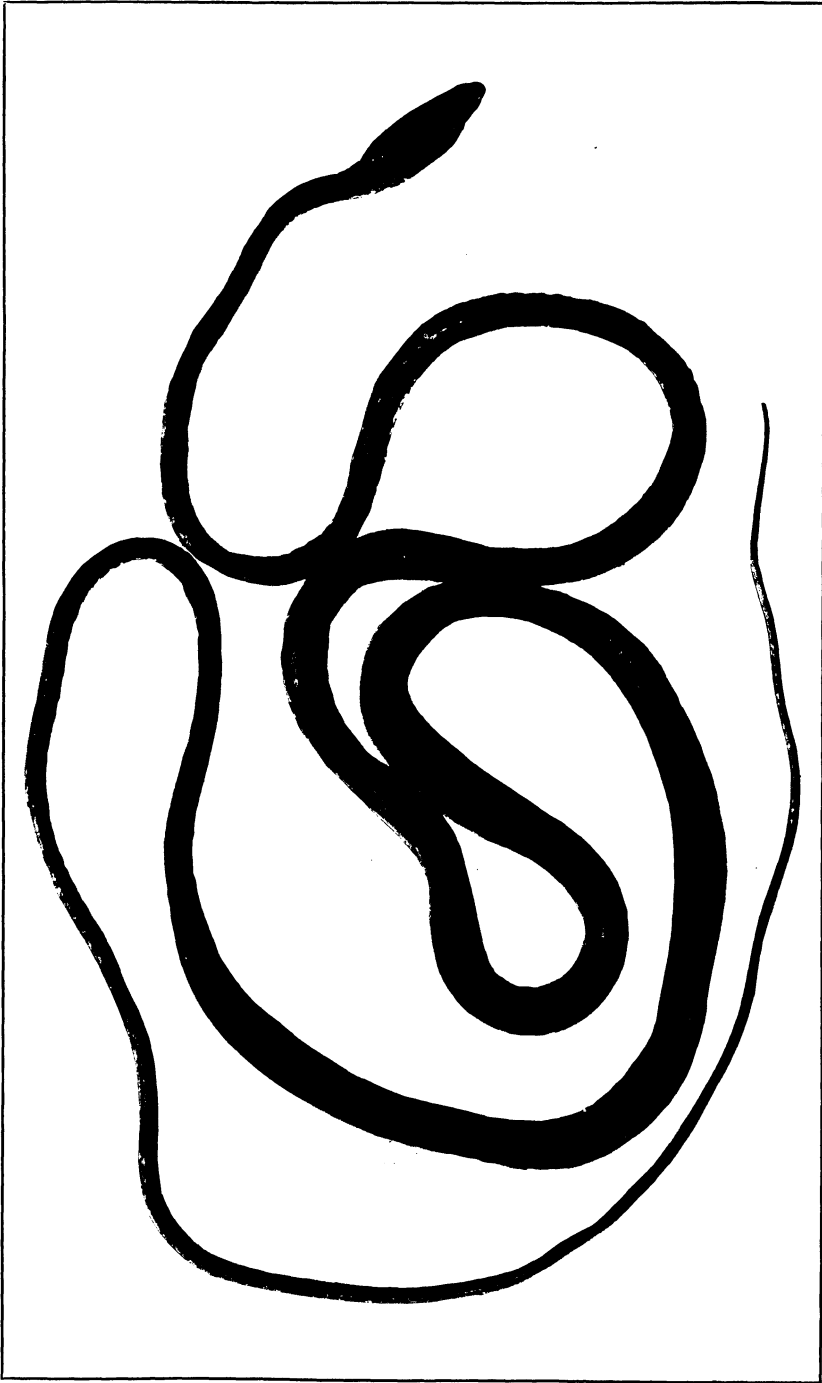


PLATE 28. DRYOPHIS PREOCULARIS SP. NOV.



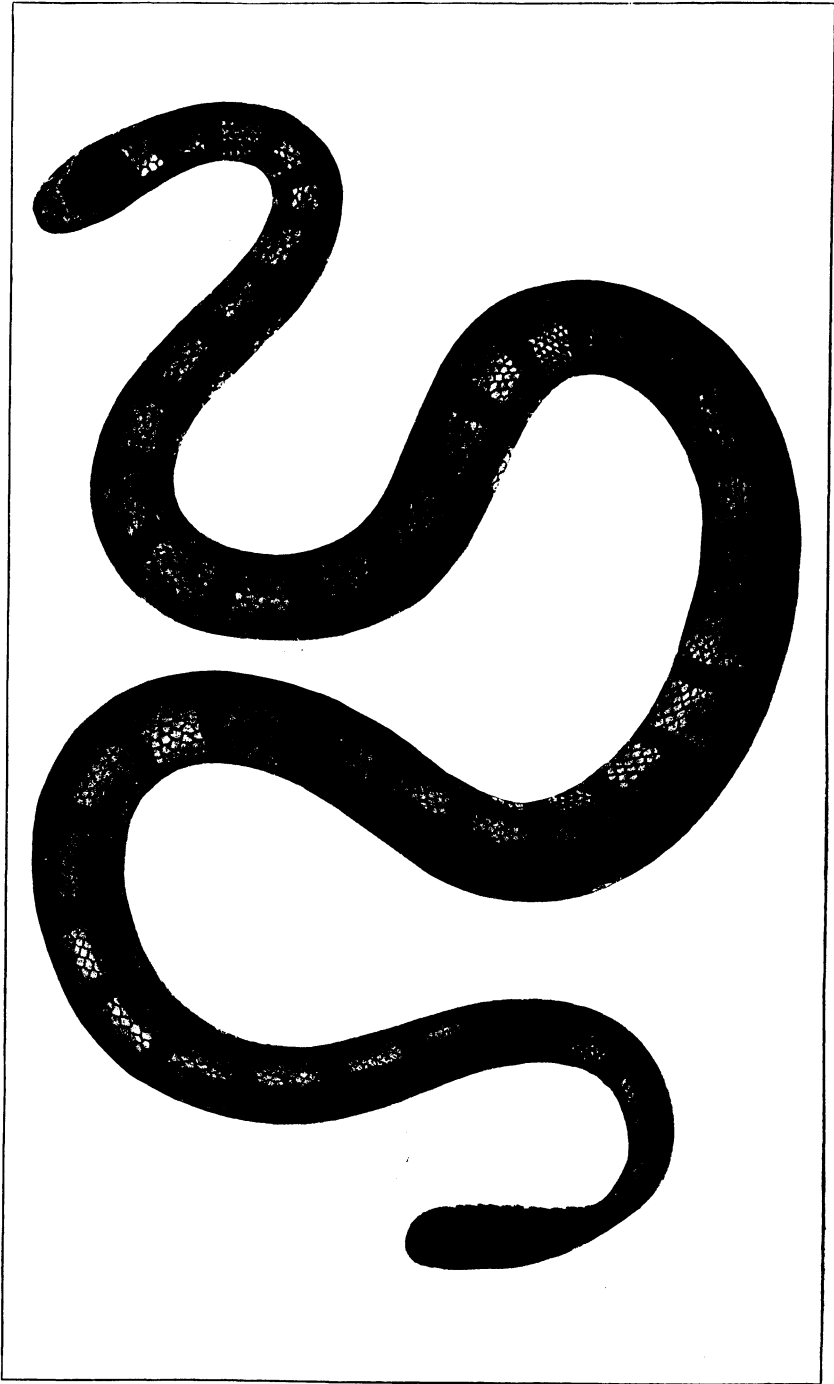


PLATE 29. LATICAUDA COLUBRINA (SCHNEIDER).



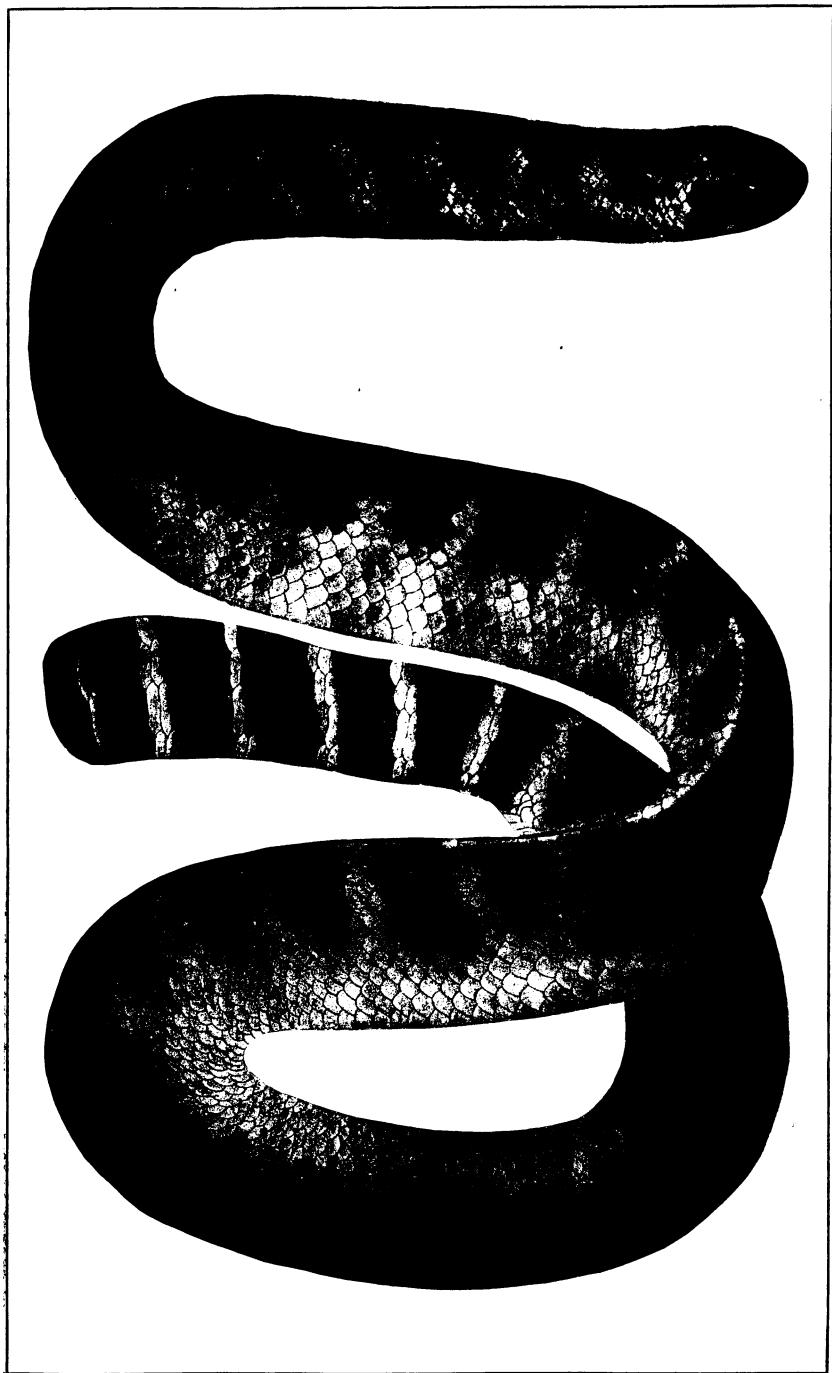


PLATE 30. LATICAUDA SEMIFASCIATA (REINWARDT).



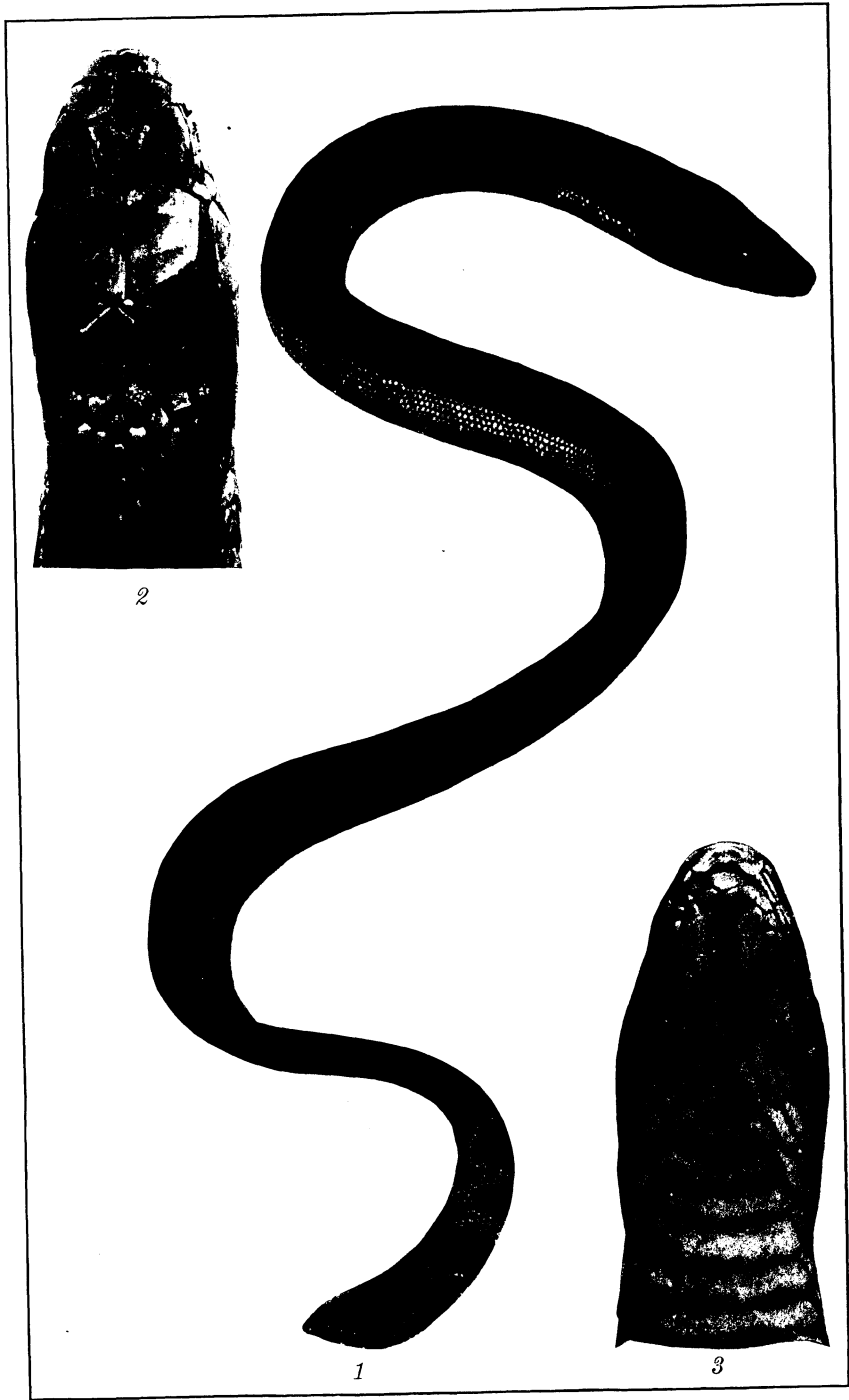


PLATE 31. PHILIPPINE SNAKES.





PLATE 32. NAJA NAJA MIOLEPIS (BOULENGER).



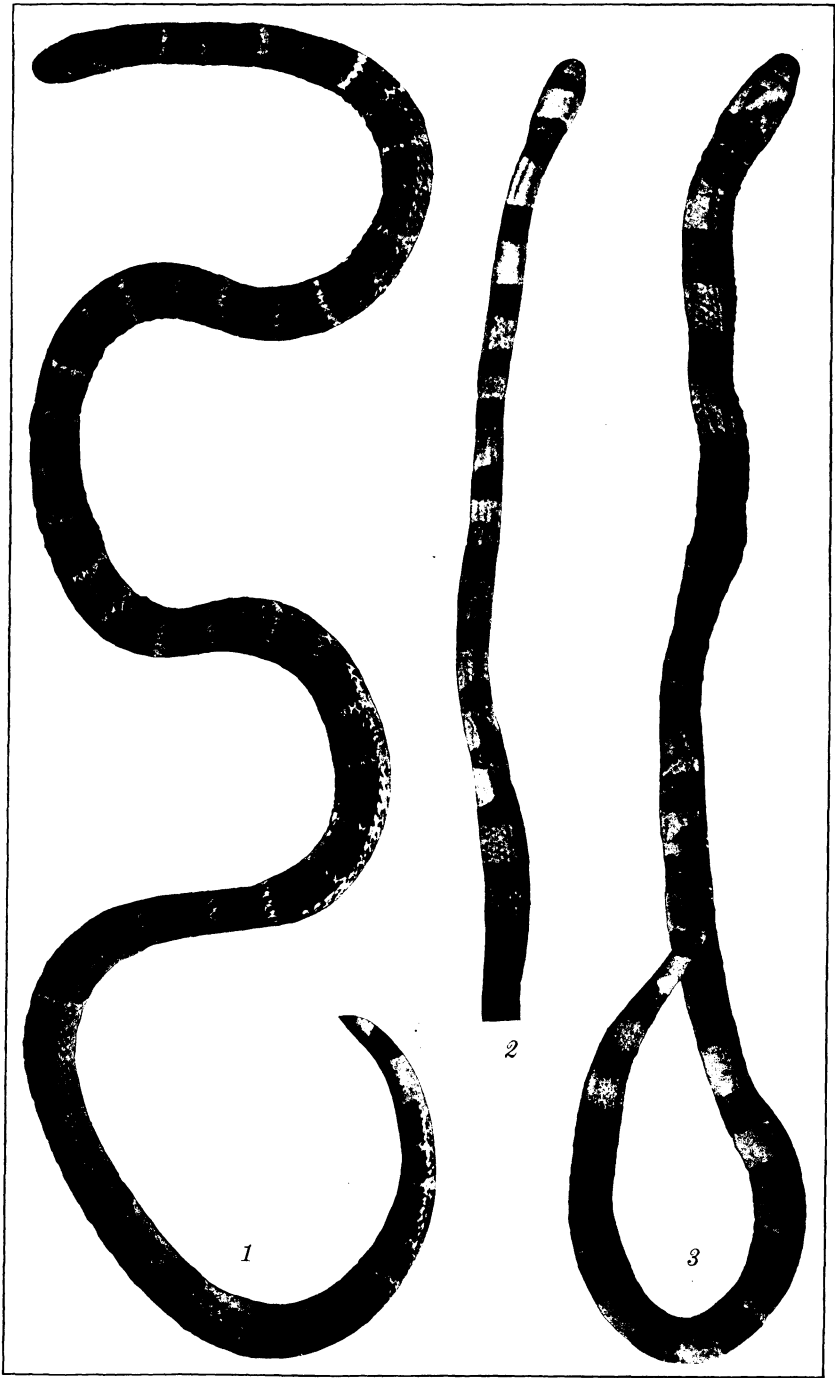


PLATE 33. PHILIPPINE SPECIES OF HEMIBUNGARUS.



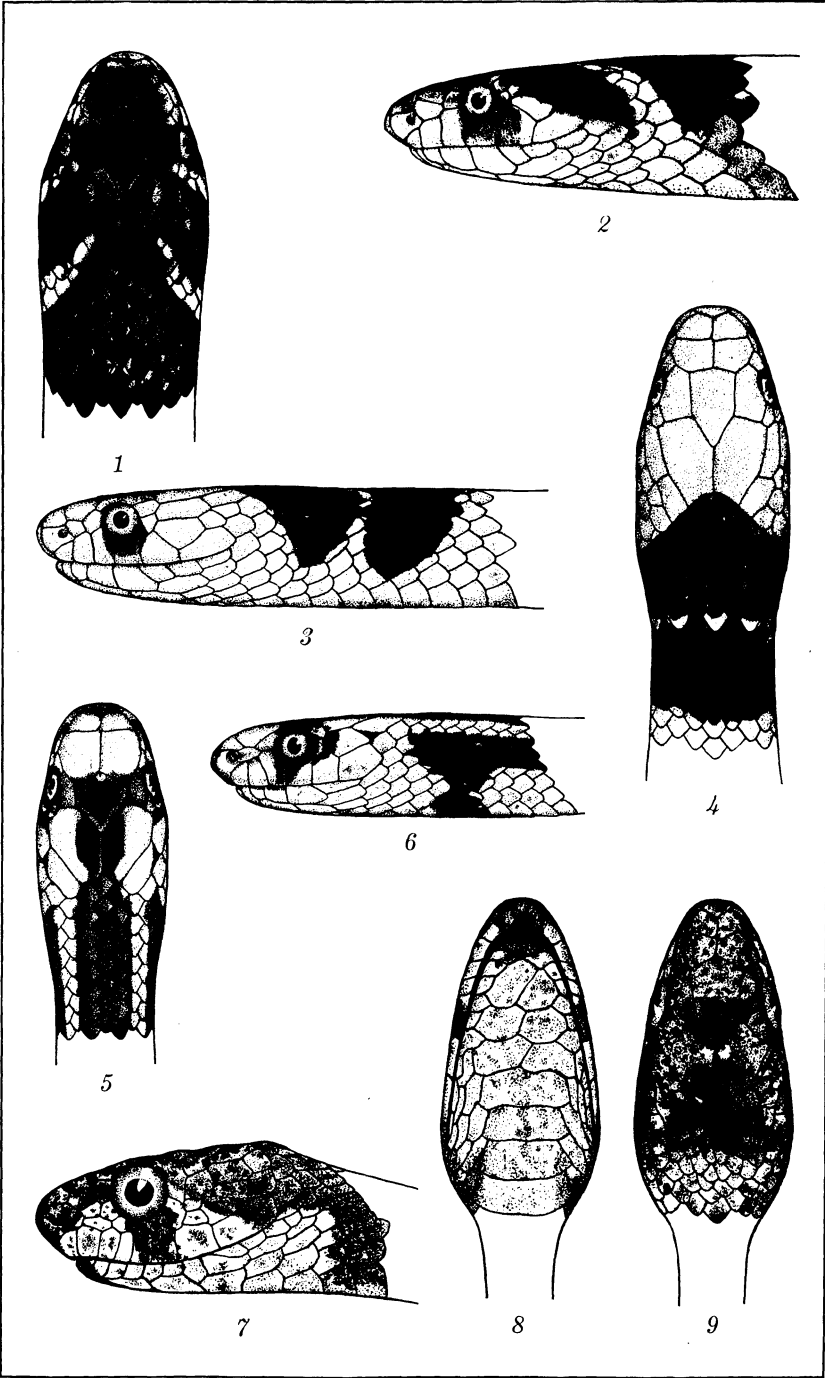


PLATE 34. PHILIPPINE SNAKES.



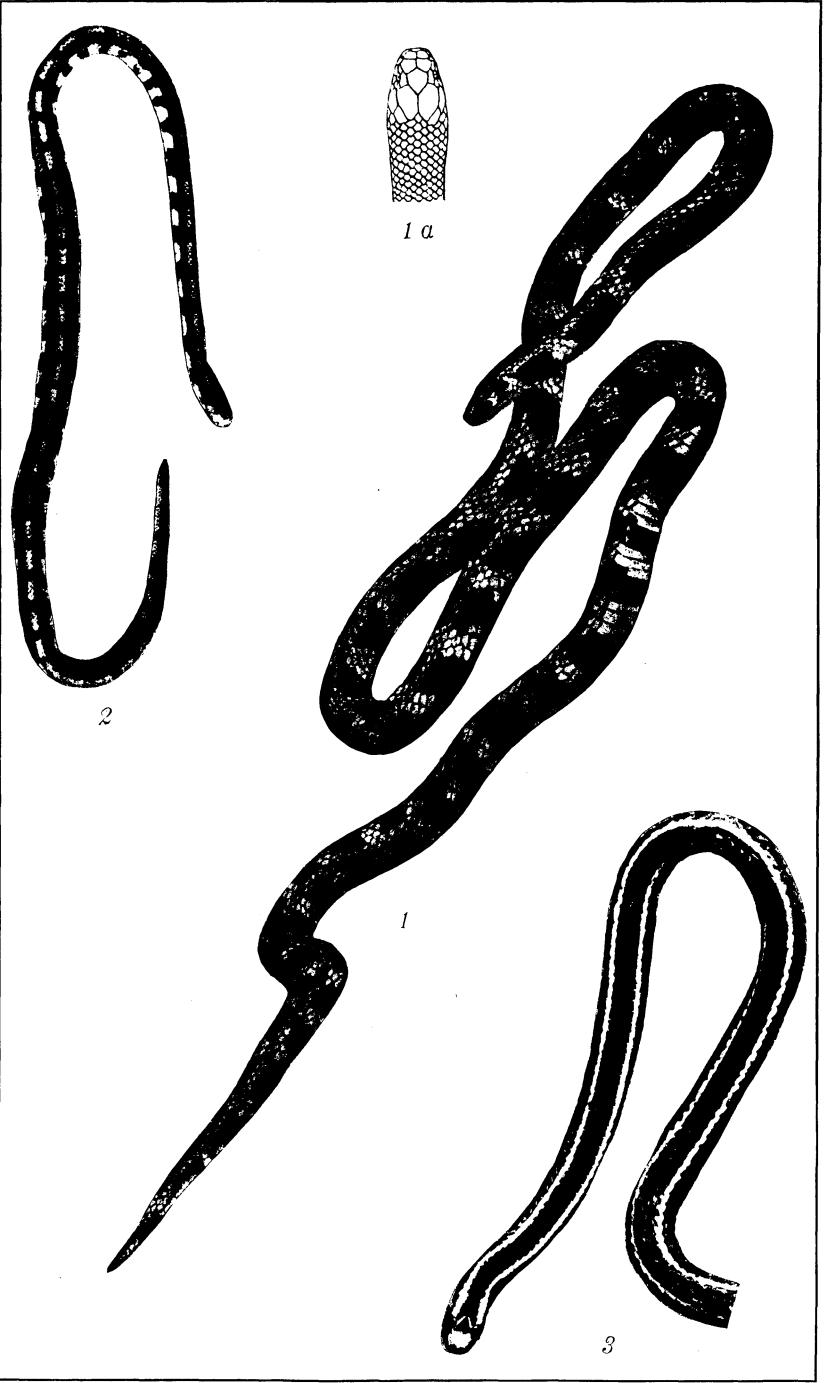


PLATE 35. PHILIPPINE SPECIES OF DOLIOPHIS.



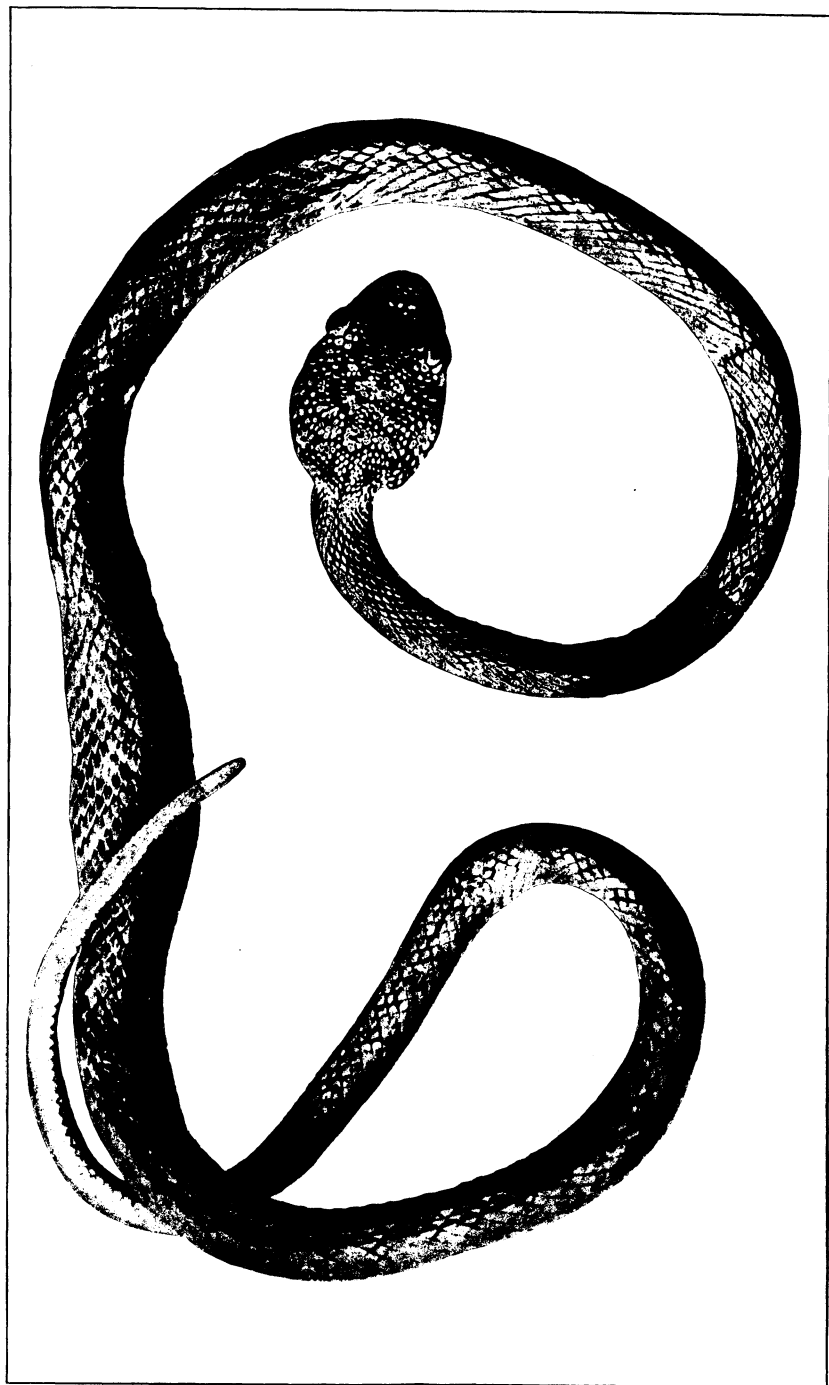


PLATE 36. TRIMERESURUS SCHULTZEI GRIFFIN.



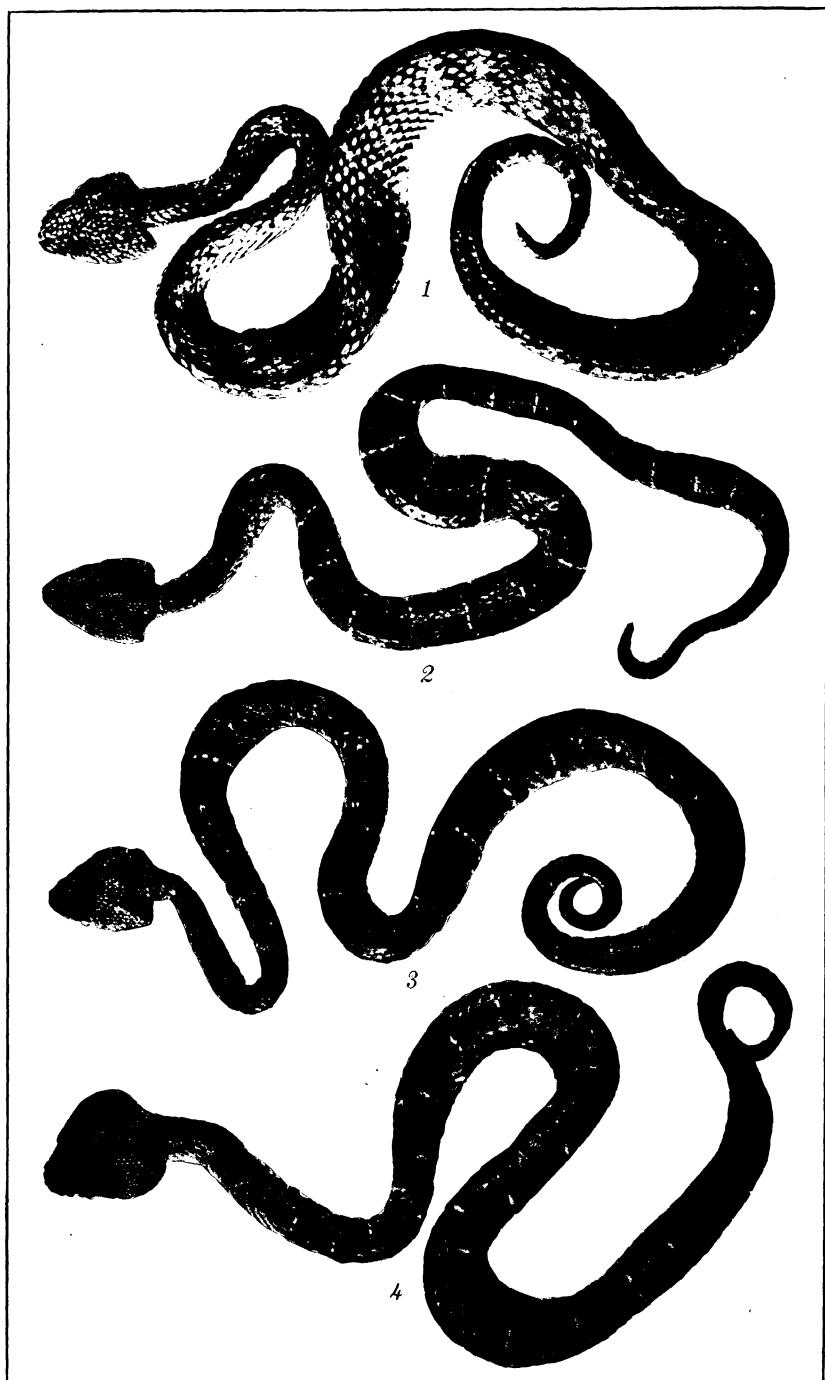


PLATE 37. PHILIPPINE SPECIES OF TRIMERESURUS.



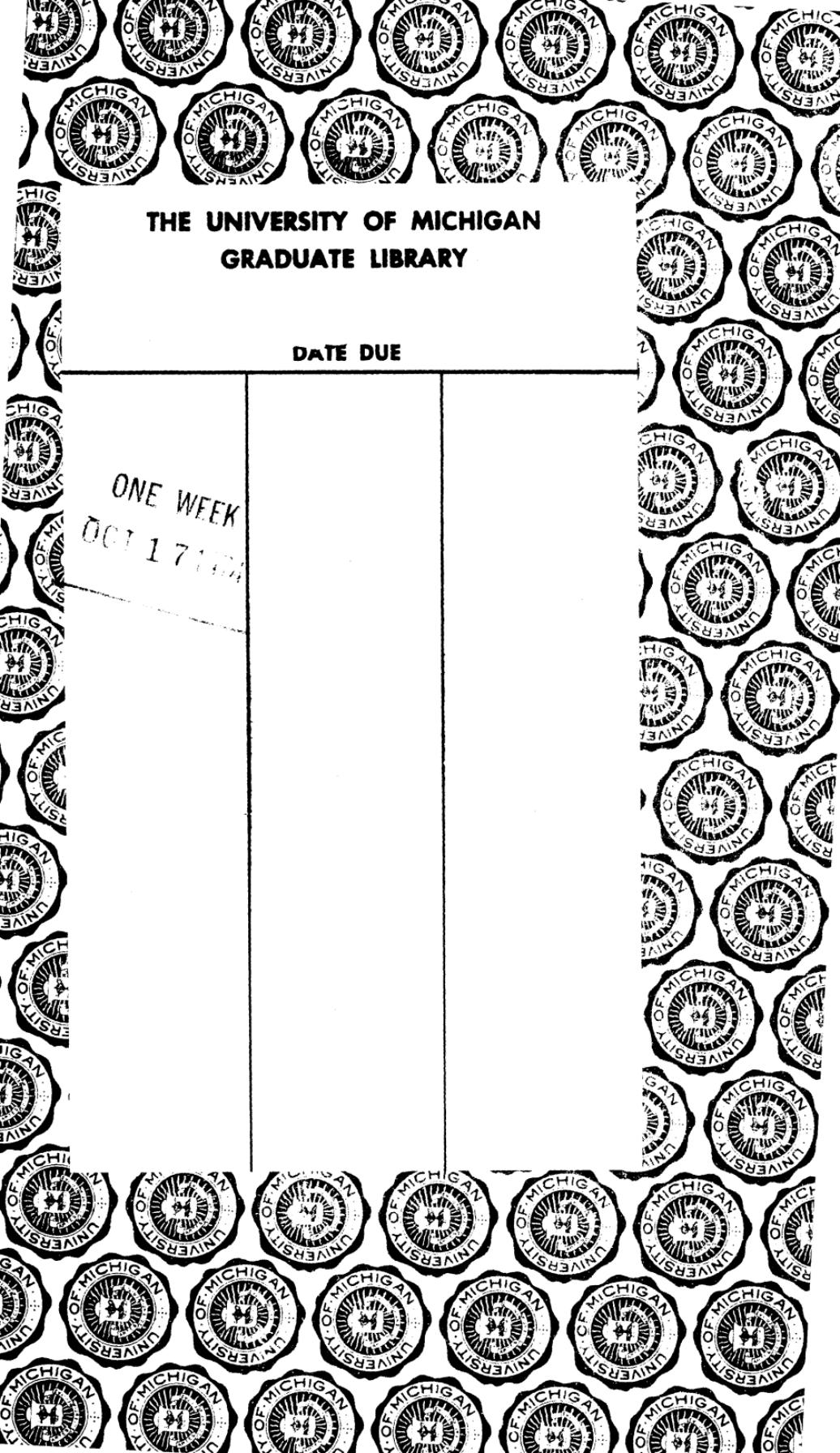










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